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Guarding the Sight of School Children*

Edward Jackson, M.D.

FOR the majority of people in this and other civilized countries, the activities of the years of school life present the greatest stress and danger to sight they ever encounter

THE prevention of blindness is more than keeping off the streets men or women who feel their way with white canes, or who may be guided by German police dogs. Among 1000 applicants for blind benefits in Colorado, only 300 were absolutely blind, and at the State School for the Deaf and Blind over 80 per cent had some vision.

For every one who is completely blind there are 100 who are going toward blindness, already more or less crippled by poor sight and living in the fear of what they believe will be worse than death; and a thousand who are already limited and handicapped by defects of vision of which they may or may not be conscious.

The reduced productive power of 1000 workers, the thwarted ambitions, the diverted lives, the actual disabilities of sickness produced by visual defects, may be a more important loss to the community than the complete blindness of a few which all may pity and the seeing may dread.

Percentage of Blindness That Could Be Prevented

Of those who become completely blind the most recent and reliable statistics of Harry Best in his book, *Blindness and the Blind in the United States*,[1] indicate that 72 per cent are blind from preventable causes. In a large proportion of the cases the causes

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, Inc., Dinner Meeting, December 4, 1936, sponsored by the Columbus, Ohio, Academy of Medicine.

[1] Best, Harry: *Blindness and the Blind in the United States.* Macmillan.

that ultimately produce the blindness have been operating for many years before the danger of such a result provoked any attempt to prevent blindness, or was even suspected. The cases of blindness from accident include 16 per cent of the total cases of blindness and of these, more than half, 69.9 per cent, occur before twenty years of age. Practically all the cases of myopia that may lead, fifty years later, to cataract, detachment of the retina, or atrophy of the choroid, as causes of blindness, start or develop most rapidly during school life. The effective guarding of the vision of school children will prevent most of the blindness of old age; and among those who do not become blind, it will prevent a great mass of visual disability, nervous disability and chronic ill health.

For the majority of people in this and other civilized countries, the years of school constitute the greatest stress and danger to sight that they ever encounter. Almost the whole educational process is based on the use of the eyes. And yet, in general, there has been no intelligent effort to secure the use of the eyes in the safest and least injurious way and under the most favorable conditions. There has been very little teaching of how to use the eyes to the best advantage; and no warning of the dangers to be encountered, and how they may be avoided or minimized.

We have all been impressed with the swift development of modern science. Biological science and medical science are the young and swiftly developing branches on the sturdy tree of knowledge. So rapid has been the increase of medical knowledge that it has outstripped the slowly acquired capacity of the human mind to grasp and apply knowledge. For this reason, medical specialization in study and practice has been forced upon us, if we would relieve human suffering by the already known methods and resources that have become available. Yet this age of specialization has been only another step in preparation for the great expansion of medicine that is developing, from the treatment to the prevention of disease.

The last visit of Sir William Osler to America was in 1913 to deliver the Silliman Lectures at Yale University. These, which he described as "an aeroplane flight over the progress of medicine through the ages," were published under the title, "The Evolution

of Modern Medicine." Starting with the history of Egyptian, Assyrian, Chinese, Japanese, Greek and mediaeval medicine, these lectures led up to the last on "The Rise of Preventive Medicine." For more than 2000 years the epidemics of plague had devastated Europe, Asia and Africa, sometimes killing more than half the people in a city or a province. Malaria and yellow fever sealed the fate of cities, or nations. When the causes and prevention of these diseases were studied, they ceased to be terrible and are now forgotten by people who have never seen them.

Smallpox

When Jenner first tried vaccination, smallpox caused one-eighth of the blindness of the world; and it still causes such blindness where there is no vaccination. Where compulsory vaccination is enforced, it has ceased to be a cause of blindness. Ignorance, superstition and faddism still keep smallpox alive in England and in this country. In Colorado, cases occur almost every year among the isolated Mexicans in the south of the state. There have been 10 or more drawing blind benefits for blindness from smallpox. The number of these has been gradually decreasing, and in the United States it decreased one-half between 1910 and 1920. Education of the whole people is a slow method of preventing blindness; but in the end it is effective, and is the only method that can be relied upon.

Ophthalmia Neonatorum

In regard to ophthalmia neonatorum, the value of education has been well demonstrated. By 1907 the writings of Howe, Park Lewis, and others in this country, and N. Bishop Harman in England, had made it a reportable disease; and laws requiring the use of silver nitrate solution in the eyes of infants have educated the physicians and nurses to the importance of prophylaxis. Before that, the admission to homes and schools for blind children shows as high as 30 per cent blind from ophthalmia neonatorum. But from that time the numbers steadily declined, until in 1936 the percentage had come down to 7.5.[2]

[2] *Ibid.*, p. 138.

Trachoma

A similar result with regard to trachoma was achieved by the segregation and treatment in residential schools outside the city of children affected with trachoma in the County Council Schools of London. At first, two such trachoma schools were required, each accommodating 750 children. Later, only one was required and the other was closed. Still later, the cases in London did not fill the one school; and since then, children with trachoma from other parts of England are admitted to the school at Swanley.

For ophthalmia neonatorum we can rely on prevention by the Credé method only if applied within a few minutes of the time of birth. In Mexico, the health authorities have provided ampules of the silver nitrate solution for distribution in isolated districts to be ready for the emergency. The experience of Dr. Joseph Price at Preston Retreat seemed to show that prenatal disinfection of the birth canal might be equally effective and also afford benefit to the mother.

Blindness from Syphilis

We have learned in recent years that some forms of "congenital" blindness are amenable to preventive medicine. A large proportion of congenital cataracts is due to syphilis; and, by adequate antenatal treatment of the mother, even as late as the fifth month of pregnancy, these may be prevented. A form of luetic chorioretinitis appearing at birth, or in early infancy, may also be prevented. Perhaps the Wassermann test and other blood tests for lues have the greatest practical value when applied to the pregnant woman. Certainly antiluetic treatment during infancy and early years of childhood will prevent blindness from interstitial, or parenchymatous, keratitis. This was brought to the attention of our Conference two years ago by Dr. Holloway and Dr. Stokes, of Philadelphia. These facts bring out the real possibilities for the prevention of blindness. True hereditary blindness, as by microphthalmos and anophthalmos, is rare: the facts reported from the Texas Agricultural College to the Association for Research in Ophthalmology last year seem to show that such blindness may be prevented by appropriate feeding.

Prevention of Eye Accidents

The suggestion of Oliver Wendell Holmes that we must go back three generations to guard against some diseases has often been quoted with approval but practically never tried. For prevention of blindness we have never effectively guarded one generation. If this is to be done, it must begin at the beginning. Blindness at birth is quite exceptional. What we now know about it indicates that much can be done to prevent it. The bulk of blindness comes from causes that begin to operate after birth and these are for the most part preventable. The acute contagious diseases are largely under control; the prevention of accidents has been shown quite practical by the campaign for "safety first," which has been profitable in dollars and cents to the corporations that have taken it up. Since the majority of blindness from accidents comes before the completion of school life, the prevention of such accidents should begin at the beginning of school life. The formal training of the young should begin earlier than it does; and should begin with care of the body, as the body gets most of its development before the age of six years, at which age children are supposed to be ready for school. It may well begin at four. Not that there should be any rigid age limit; but the majority of children by that age should be given contacts outside the family circle and they need training that very few get at home.

Supervised Play

The two years from four to six can be given to playground, supervised exercises, based largely on games that children of that age are inclined to play, chosen largely by their own initiative and guided or restricted by intelligent understanding of health needs and progressive symmetrical development. With this can be taught the prevention of accidents; the dangers of fire, explosives and pointed implements; regard for the safety and rights of others, and the difference between activities and excesses. The concrete examples furnished on the playground may be utilized to teach effectively the basic knowledge and attitudes that are most neglected in our system of common school education. In "blind-man's buff" and variants of the game, children can easily be taught the essentials of vision and what a calamity blindness is.

Preschool Vision Testing

This preschool period is the time when every child's sight and hearing should be tested to determine whether they are ready for the use that will be expected of them when he begins to study with books, maps and blackboards, and has to be guided by the spoken word of the teacher.

The eyes have not been prepared for school work by evolution. The eyes of the lower animals are fitted to detect distant objects, and particularly moving objects in any part of the visual field; and the human eye also has this kind of vision. But this is not the kind of vision required for school work. It seems absurd that we should conduct examinations at the end of each semester, or period of the season, on the studies that the child has been over, and never take into account whether he has had a fair chance to study—to use eyes and ears—and whether they were not seriously handicapped before we put them in the mill. In school work and in the finer mechanical occupations of civilized men, distinct vision for small objects held close to the eyes must be kept up continuously. What is going on in other parts of the visual field, or at a distance, we do not need to see and is often best not brought to our attention. In the human eye this needed kind of vision is provided for by the development of the macula, a part of the retina which differs in structure from other parts and develops after birth to a greater extent than other parts. To get the best idea of small objects held close, both eyes must be directed to the same point and moved accurately together. In school work this new, exacting vision for small objects, such as letters and figures, is to be kept up a large part of the day. We must realize that school work is the hardest work that most eyes ever have to do and that such work is to be done for the most part under very unfavorable conditions.

Adequate Illumination

In playgrounds and the open fields, the eyes see by daylight illumination of from 200 to 10,000 foot-candles. In the schoolroom, even when "well lighted," the light on the book rarely amounts to 100 foot-candles, is often down to 20, and in dark parts of the room and on cloudy days, may be as low as 10 to two foot-candles. In the evening when the eyes are used for study at home, the light is

often more feeble than the poor light at school. If anyone is skeptical about the importance of good light, let him try this experiment: Take fine print, such as you can always find in a dictionary or a telephone directory; look at it in an "ordinary" light. Then take it where the sun can shine directly on it and notice the difference that makes on your ease in reading it. People say the sun is too bright. It is too bright to look at; but it is not too bright to illuminate things we wish to see. Except for the continuous reading of black print on white paper, direct sunlight is not too strong to see by. We do not need brighter neon signs at night, except where they are depended upon to supplement poor street lighting.

Another experiment that should be made in every schoolroom—at least in every schoolroom I have seen—is to measure with a light-meter the amount of light falling on the book or paper in the position in which it will be placed for reading or writing. The teacher's desk must not be excepted for any complete survey. A great deal of testing and thinking will have to be done before we can fully appreciate what it means to shut the child in from outdoor, natural light to do the difficult eye work called study.

There is a general assumption that all children can see; and parents generally assume that their children are normal. This accounts for the fact that most children come to school under the supposition that their eyes are good enough to stand the strain of school work. The more this supposition is inquired into, the more evident does it become that it is often false. Justice to every pupil can be done only when we understand his handicaps. This means that the eyes of every child should be accurately measured and tested before he is expected to read books or see things on the blackboard. This may come as a shock to those who have full confidence in their untested assumptions, but it is a simple scientific fact; and it cannot be dismissed by any statement, "It is impossible," or "It will cost too much."

Qualifications for Testing Vision

Any teacher who is qualified to teach first grade children, can test their vision. It requires only good light, simple, inexpensive apparatus, and a little study, which may prove of advantage to the teacher's own eyes and will pay for all the time and attention

it requires. The first step in guarding the vision of school children is to find out how good that vision is to start with. Then we can plan for keeping it good through school years and teach how to always use the eyes to best advantage.

In starting a policy of sight saving for all school children, difficulties will be encountered. The poor lighting in many schoolrooms cannot be replaced by good lighting for many a day. But in most of them, the lighting can be improved to some extent. In some rooms, more light can be let in by removing shades. Without rebuilding, artificial light can be introduced to supplement the daylight when that is most deficient. In other rooms, rearrangement of seats will make it possible to have more light on the page that is to be read or written upon. The hours of study and recitation can be timed so that the things that will tax sight most can be done when the light is best. The wearing of glasses will bring many who now have quite poor vision up to normal standards. This will reduce the number who must be especially favored in seating to get the best light. In all this the teacher, who understands what the children need, must be supported and assisted to overcome the resistance of principals, supervisors and school boards who do not understand what these changes are all about. Ohio is the first state with a state-wide plan for sight-saving classes—a broad rational movement for the prevention of blindness. Not only does it prevent blindness that needs a white cane or a trained dog; but it will help many others who have to contend with narrow limitations of visual acuteness and endurance.

When all this has been done, there is still need to teach each pupil how to place himself and his work so that the best light obtainable will fall squarely on the thing he wishes to see. Only by his own understanding and attention to these details of good lighting can we hope to remove all unnecessary strain and get the best conservation of vision—do the most for the prevention of blindness.

Myopia

The correction of the optical errors of the eye, by the best possible glasses, has been widely stressed and needs to be mentioned only for new emphasis. There is one defect of refraction that is

largely caused and increased by school work. The great majority of myopic eyes become myopic and increase their myopia under the influence of school work. This has been known since the eyes of school children were first examined for optical defects. All extensive statistics show that at birth nearly all eyes are farsighted; that they become nearsighted when the child has to begin to look at small objects held close to the eye; and that they become more nearsighted as the eyes are used for close seeing in school. By finding that the eyes are nearsighted—myopic—by giving glasses that will enable these eyes to see things clearly at a distance and by seeing that the child stops holding things too close to the eyes or bending down to see, the increase of myopia can be stopped in nearly all cases. Myopia might properly be called the school defect of the eye. Contending theories of myopia obscure and divert attention from the established facts; but for the prevention of blindness from myopia, what we know about it is enough to start us and keep us going in the right direction. The theory of the production of myopia by excessive convergence of the eyes in near seeing may still be disputed, but the evidence for it is so clear and widely corroborated that it need not be discussed here. The exceptions that are cited against it, under careful examination, are found to support it.

Myopia depends on serious departure of certain parts of the eye from normal nutrition. Neglected and allowed to go on through years of eye work, it usually brings extensive disease and is prone to end in choroidal atrophy, opacities of the vitreous, cataract and detachment of the retina, causing many cases of blindness. The early control of myopia and prevention of such changes in the eye are important in the prevention of blindness.

Cataract

Other departures from health in the eye contribute largely to the blindness of old age but begin years before they are so recognized. Cataract may be started when a child is born but not produce blindness that will arrest attention for many years. It is the most common cause of blindness and is mostly thought of in connection with old age; but it begins years before it is noticed, and the time to prevent blindness is when it is still non-existent. When

we remove a cataract, it is not to change the days of blindness that have already passed, but to prevent blindness in the years that yet remain. In the *Transactions of the American Ophthalmological Society* of 12 years ago was published a paper giving details of 108 cases of cataract watched for periods of from two to 19 years, an average of six years, under conditions of good general health. In that paper the conclusion was drawn:

"For a patient of the average age of 65 years—presenting commencing senile cataract—the probability is that, under proper hygienic care, it will be 20 years before the cataract becomes mature and 15 years before he loses the power of reading ordinary print."

The paper was discussed by 15 members of that Society without any disagreement with this conclusion. Since then, a patient has died at the age of 94 without an increase of the disability caused by cataract in the 30 years she was under observation.

Glaucoma

Next to cataract, glaucoma is the most common cause of blindness in old age. Laquer, the ophthalmologist of Strasbourg, France, had his first attack of acute glaucoma at the age of 35 after a hard day in the operating room. He controlled these attacks for six years with eserine. Then he found the drug, and careful avoidance of excitement, no longer controlled the disease. He went to Horner, of Zurich, who did iridectomy on each eye, giving complete relief from the attacks and preserving good vision until Laquer's death, 30 years after his first attack of glaucoma. I have seen a case of double glaucoma, recognized by the late Peter A. Callan, of New York, who did iridectomy on one eye and advised it for the other; but under the use of pilocarpine and eserine the attacks ceased. There was no return of glaucoma in either eye, and the patient retained standard vision 15 years later.

Trachoma

Trachoma is a common cause of blindness throughout the world. Its control in London has already been mentioned. During the world war the labor companies that came to France from China,

India, South Africa and Egypt included men who suffered with trachoma. But under rigid control of these men there was no infection of others. They were sent home at the close of the war in better condition than when they came. Under our Public Health Service trachoma is being eradicated in the United States.

Conclusion—Results of Instruction on Good Sight

Besides guarding the school children from the causes of blindness to which they are especially exposed, the instruction that can be given them as to what is good sight, how it can be kept good and the importance of keeping eyes healthy will, in time, educate the whole people in the prevention of blindness for their years of productive labor and of happy leisure.

The Management of Industrial Eye Injuries in their Relation to the Workmen's Compensation Laws*

Elbert S. Sherman, M.D.

THE compensation laws have been largely responsible for the creation of the new medical specialty: industrial or traumatic surgery, in which ophthalmology plays an important part.

WHEN one thinks of industrial ophthalmology, he naturally thinks of eye injuries. Their prevention is the most important part of the whole subject. This includes such matters as preemployment and periodic eye examinations, illumination, goggles, masks and other safety devices, safety education, etc. These subjects I shall not discuss. They are adequately dealt with in various publications. The educational work of such organizations as the National Society for the Prevention of Blindness has been very effective in the reduction of the number of industrial eye injuries. There is still need for much further work along this line. Neither do I care, nor is it necessary, to say much about the treatment of eye injuries to a group of this kind. I thought that some of you might be interested in some remarks based on experiences in the management of industrial eye injuries in their relation to the workmen's compensation laws.

Let me say at once that I am not an industrial ophthalmologist in the sense that I am on the payroll of any corporation, nor do I devote a large part of my time to industrial work. I seldom visit a manufacturing plant. However, during the past 20 years I have seen quite a large number and a great variety of eye injuries which

* Presented December 11, 1936, as one of a series of talks by various ophthalmologists, for internes, sponsored by the New York Eye and Ear Infirmary.

have been sent to me either for treatment or for examinations by many industrial concerns and casualty insurance companies. I know of no class of work that is more interesting and satisfactory, but I have not permitted it to subordinate or interfere with my regular or more private practice. In order to accomplish this, separate waiting and treatment rooms are provided for workmen.

Industrial Ophthalmologists

The compensation laws have been largely responsible for the creation of a new specialty: that of industrial or traumatic surgery. Ophthalmology has felt this influence, so that now the large majority of industrial eye injuries are sent to eye surgeons who are equipped for and are willing to do this class of work. Such practitioners may be classed as industrial ophthalmologists.

At first this new field of medicine was shunned by many of the better men in the profession; the fees were comparatively small and very often some of the undesirable methods of competitive salesmanship were used in obtaining this kind of practice. Insurance companies were mulcted by excessive fees or padded bills, and other objectionable practices were engendered. Mediocre work and unsatisfactory results were inevitable. Insurance companies became suspicious of every doctor who was not known by them to be capable and honest. Disputes and misunderstandings were frequent. Gradually the insurance carriers and large employers realized that from an economic as well as a humanitarian standpoint it was to their interest to employ the best surgical skill available. Several large casualty insurance companies have now, in self defense, adopted the practice of furnishing their assured with a list of approved surgeons and eye specialists with a request that injured employees be sent only to those listed.

Workmen's Compensation Laws

Twenty-five years ago the first employer's liability laws were enacted by a few states. They are commonly referred to as Workmen's Compensation laws. Hence the now familiar terms "Compensation injuries," "Compensation work," etc., as usually used in connection with industrial injuries. Since then, similar laws have

been enacted by all the states, with two or three exceptions. In many respects they are practically alike. In most of them you will find a standard phrase taken bodily from the English act—compensation for "personal injury to an employee by accident arising out of and in the course of his employment." This sounds very plain and forthright, but there have been hundreds of legal disputes over the exact meaning of some of these simple words and phrases, and many of the court decisions are very interesting. For a long time there was much legal controversy over the meaning of the term "accident." The definition of an English court, that an accident is "an unlooked-for mishap, an untoward event which is not expected or designed," is now in common use, as the test of the accidental nature of an injury.

It was early recognized that occupational diseases could not be classed as accidents and that disabilities caused by them were not compensable. To correct this, the laws in some states were amended and certain specified industrial diseases were made compensable. (In New Jersey they are anthrax, caisson disease, poisoning by lead, arsenic, mercury, phosphorus, chromium, benzene, and its derivatives, wood alcohol and mesothorium. In some states the list is longer.)

At first regarded as a social and economic experiment, workmen's compensation laws are now universally accepted as humane, beneficent and practical. Partly because of them, much more attention has been given to safety engineering and safety education with a resulting large reduction in the number of accidents to workmen.

Aside from the direct beneficiaries, these laws have been a considerable boon to the medical profession. Formerly, the large majority of industrial injuries were cared for in hospitals and clinics, without pay. In most cases the employer, under the common law, was not liable and refused to assume responsibility for any expense, and the workman was able to pay little or nothing. Since workmen's compensation laws were enacted, medical and hospital care, including medicines and surgical appliances (e.g., glass eyes), are a first charge against the accident, and the surgeon may be sure of being paid a reasonable fee, provided he complies with a few simple requirements of the law.

Eye Injuries

Eye injuries are the most serious and expensive of non-fatal industrial injuries. In Pennsylvania, during the first eight years experience under the compensation act, more than 40 per cent of all compensation awarded for permanent injury was for eye injuries. According to Resnick and Carris,* 15 per cent. of the 100,000 or more blind persons in the United States are blind from industrial injury. There must be several times this number who from the same cause are partially blind and more or less seriously handicapped for life.

Temporary Disability

Compensation is paid for two classes of disability—temporary and permanent. Temporary disability is the period of time during which the employee is unable to work, and compensation begins after a so-called waiting period, which is usually about one week. Further treatment and observation may be continued as long as necessary but compensation, which is a major fraction—the amount varying in different states—of the weekly wage, ceases when the employee is able to return to work. Then, compensation for permanent disability, if any, begins.

Permanent Disability

Permanent disability, or impairment of function, may be partial or total in character. In the case of the eye, total disability is impairment of vision to or below the point of industrial blindness, as the result of injury—also, the loss of most of the visual field or the loss of the use of the eye as in permanent diplopia. Various courts have ruled that the loss of the use of an eye is equivalent to the loss of the eye itself. In defining the term, industrial blindness from loss of visual acuity, arbitrary standards have been established which vary somewhat, but not greatly. In most states 20/200 Snellen is the standard.

It is necessary that anyone who takes care of an industrial eye injury be familiar with the method of computing the percentage of loss of visual efficiency. In making this estimate the three pri-

* Resnick, Louis, and Carris, Lewis H.: *Eye Hazards in Industrial Occupations.* National Society for the Prevention of Blindness, Inc., Publication number 26.

mary and co-ordinate factors of vision just mentioned, viz., central visual acuity, field of vision and muscle function, must be considered. In about 95 per cent of cases, however, central vision is the only factor involved. Standards and values are not the same in all the states. A good guide, and one which I believe has been adopted in a number of states, is the Report of the Committee on Compensation for Eye Injuries, of the Ophthalmological Section of the American Medical Association, published in 1925. This is too large a division of the subject to take up at this time. Methods of computing the percentage of visual disability are not the same in all the states. It is advisable that you familiarize yourself with the method in use in the state in which you practice, and also with the compensation act.

Most cases of industrial eye injury are sent to the eye surgeon for one of two reasons: first, at the time of the accident, for treatment of the injury; and second, during the treatment or after its termination by another surgeon, for an examination and independent opinion concerning the extent of the disability, its relation if any to the recent accident, the ability of the employee to return to work and other questions pertinent to the case.

Records Which Should Be Kept

Every industrial eye injury, no matter how trivial it may seem at first, is a possible case for litigation. For this, as well as for other reasons, when first seen after the accident an adequate history should be taken, particularly as to when, where and how the present injury occurred; also any pertinent information concerning previous eye injuries and diseases. A record should be made of the visual acuity of each eye and of any evidence of former injuries or disease or gross refractive errors. Such records are sometimes very valuable when a claim for alleged disability resulting from the accident comes up in court. This may be many months or even years later. In the meantime the employee's story concerning the cause of the injury may have changed completely, as well as denial of previous eye disability. Every year employers and insurance companies pay large sums for disability, part or all of which existed prior to the accident or alleged accident on which the claim is based.

Reports

One of the duties incidental to industrial surgery is the making of reports. These are necessary. In the case of insurance companies, the surgeon's report is the authority the claim department must have for making payments for temporary or permanent disability, or for paying medical or hospital expenses. To those who are unused to compensation work, reports are irksome and unpleasant—often unnecessarily so. The large majority of eye injuries are slight, require no extended treatment, cause no disability, either temporary or permanent, and require only a very brief report. In such cases only a few questions in the standard forms sent by some insurance companies need be answered. They are interested chiefly in being informed as to three things: first, whether the case is compensable, i.e., whether the injury was caused by accident arising out of and during the course of employment; second, the extent of the temporary disability; and third, the percentage of permanent disability, if any. Most of this work can be handled by a competent office assistant, secretary, or nurse. Severe injuries and those requiring extended treatment should have more detailed reports. Insurance companies appreciate a prompt report on all cases in which there is likely to be considerable permanent disability, so that a proper reserve charge may be set up, pending settlement.

When there is likely to be some permanent disability, a final report should not be made until function has been restored as completely as possible. In most cases it is evident at once that there will be little or no disability; in a few it can be seen immediately, from the nature of the injury, that a total loss is certain. In other cases, after the acute symptoms have subsided, sufficient time should elapse for the gradual improvement which often occurs and continues over a period of months, or for the development of sequelae, before making a final examination and report. This applies particularly to corneal injuries, iridocyclitis, opacities in the lens and vitreous, partial optic atrophy and paralysis of the ocular muscles, both external and internal.

An estimate of the permanent visual loss caused by scars of the cornea should never be made during the first few weeks following the accident. Some scars which at first are fairly dense and ex-

tensive, almost completely disappear in time. I have seen eyes in which the vision was reduced by a corneal scar to industrial blindness, improve to 20/30 Snellen within a year. Likewise diplopia from paralysis of ocular muscles often clears up slowly but definitely in time.

Several years ago, at the suggestion of the plant surgeon of a large manufacturing concern which had and still has many eye injuries, I devised a small blank form which has simplified the matter of reports, and has been a great time saver in my office. It is a small sheet 5½ inches square, with blank spaces for the date, the name of the workman, the diagnosis, when to return for further treatment, temporary disability, permanent disability and the time of arrival at and departure from the office. Filling it in requires but a moment of the office assistant's time. If further treatment is required, another report is given at each visit, thus keeping the employer informed as to the progress of the case. The workman takes the report with him in a sealed envelope and the employer, if he is not self-insured, sends it to his insurance carrier. In the majority of cases, particularly those of self-insured concerns, this brief report is all that is required. For serious cases a special report is sent at the conclusion of treatment.

Complications in Evaluating Visual Loss

The evaluation of visual loss resulting from an injury is often complicated by the presence in the same eye of a non-compensable or pre-existing defect. This may be a refractive error or a pathologic change. It has been shown that such defects are present in over 20 per cent of workers.[1] In these cases it is sometimes impossible to say what percentage of the total disability is the result of the recent accident. Very often the workman will not admit that the eye was previously defective. If the case is seen soon after the accident occurred, old defects can usually be recognized as such and noted, but when, as often happens, it is sent weeks or months later for an opinion as to the percentage of permanent disability and its relation to the recent accident, the difficulties may be very great. Attempts are often made to capitalize such

[1] McAuliff, M.D., George R.: Noncompensable Visual Defects in Industrial Ophthalmology, *American Journal of Ophthalmology*, September, 1928, p. 714.

conditions as old corneal scars, lens opacities which are manifestly senile, congenital amblyopia, old trachoma and many others. I have seen cases of old trachoma with pannus attributed to recent slight eye injuries, with denial of previous eye trouble.

Occasionally, an apparently trivial injury of the cornea or a contusion of the globe is followed by changes in the eye grossly out of proportion to the severity of the trauma. The uveal tract is most often affected, the cornea less frequently. The more common manifestations are iritis, iridocyclitis, acute choroiditis, ulceration of the cornea that refuses to heal or recurs, and interstitial keratitis. These are some of the conditions which I have repeatedly seen, following very slight and superficial injuries. The underlying cause is usually focal infection. Sometimes the source of the infection is in the tonsils but more often, in my experience, it is about the roots of the teeth. When it is located and removed, the improvement in the eye condition is often strikingly prompt and rapid.

Another cause is syphilis. Tuberculosis is an occasional factor. A few years ago at a meeting of the American Academy of Ophthalmology and Oto-Laryngology in discussing a paper by Black and Haessler on post-traumatic ocular tuberculosis, Edward Jackson said: "We have only learned within relatively few years the effect of trauma in producing outbreaks of interstitial keratitis." He felt sure that he had seen several cases from slight injury of the cornea. A latent glaucoma may take on an acute form following a superficial injury of the eye.

Under the doctrine of acceleration or aggravation of a pre-existing disease, the compensation courts usually make an award for any disability occurring in this class of cases, provided any probable relation between the injury and the disease can be established. Not infrequently a workman who is sent for treatment of an inflamed eye will say there was a foreign body in the eye a few days previously, but when questioned can fix no particular time when the alleged accident occurred, and may admit that he thought there was something in the eye because it was uncomfortable. In most of the doubtful cases the employer or the insurance carrier accepts the liability. If a case is clearly not compensable, the facts should be reported immediately to the employer (or the

insurance carrier) so that he may have the choice of authorizing or refusing further medical care.

Necessity for Immediate Care by Oculist for Eye Injuries

While many eye injuries because of their nature, location and extent, cause immediate and hopeless visual loss, the large majority are superficial wounds of the cornea from foreign bodies and other causes, which, if promptly and properly treated, recover quickly without loss of function, but if neglected or unskillfully handled, may cause months of disability and permanent loss of vision. Most industrial plants and insurance companies have learned from expensive experience the importance of referring all eye injuries to an eye surgeon. A few years ago we frequently saw eyes that had been manhandled by a fellow workman or a first-aid department, in an attempt to remove an embedded foreign body from the cornea; the eyes were red, painful, more or less denuded of corneal epithelium, and sometimes infected. This is now unusual. Nowadays such cases are more often the result of the good-intentioned but bungling treatment of a neighborhood physician to whom the workman has gone after working hours. Employers and insurance carriers appreciate and are willing to pay well for honest, expert care of industrial eye injuries—care which returns the workman to his job as promptly as possible with a minimum loss of vision.

If a foreign body embedded in the cornea is removed promptly and skilfully, it should seldom cause either temporary or permanent disability. Fortunately particles of steel and emery are usually sterile when they strike the eye. If the foreign body is removed without undue trauma and the wound is protected by the application of some mild sterile ointment, healing should be complete in a few hours, as the corneal epithelium regenerates very quickly. No dressing or other protection is needed in the majority of cases. More serious injuries, particularly if they are in or near the pupillary area, should have a dressing and sometimes atropine, but the indiscriminate and injudicious use of atropine, by paralyzing the accommodation for a week or more, causes the workman much loss of time. It is too often used unwisely and unnecessarily.

Variations in Visual Acuity Among College Students*

Ruth E. Boynton, M.D.

THE author presents results of an analysis of the visual acuity among a thousand college students—comparing their visual acuity at enrollment with the visual acuity at graduation

THE relation between eye health and general physical efficiency has long been recognized. Educational institutions, from the elementary schools to the colleges, by routine vision testing have attempted to detect students with visual defects, aid in their correction, and thus remedy what might be a serious handicap in the intellectual as well as the physical development of the student.

Although many studies have been made of changes in vision in children during the elementary and secondary school periods, little is known of what happens to visual acuity during the college period.

It is recognized that the visual acuity of a child may change during the child's growing years due to normal developmental changes in the eyeball. For example, it is apparently normal for young children to be hyperopic but much of this hyperopia may disappear by the age of 16 years. Collins and Britten[1] found in over 4000 school boys that a greater percentage had normal vision (20/20) at 16 or 17 years of age than at 6 years of age. A few years ago school work was thought to be a large factor in contributing to visual defects in young children. While poor lighting

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, Columbus, Ohio, December 4, 1936.

[1] Collins, S. D., and Britten, R. H.: *Public Health Reports*, Vol. 39, No. 51, December 19, 1924.

in the schoolroom, poorly printed books and bad reading habits undoubtedly may have some deleterious effect upon vision, the literature on this subject today leads to the conclusion that some factor or factors other than those found in the school are more important in producing deviations from the so-called normal vision.

Vision testing, usually by means of the Snellen test, has been done routinely as a part of the physical examination required at entrance by most colleges and universities for many years. The limitations of the Snellen test in selecting all cases with refractive errors are well recognized. At best, it is but a coarse screen. With it the individual with myopia will be discovered, but the hyperopic student or one with a moderate astigmatism may have a 20/20 vision and still have a refractive error sufficient to be a real handicap.

It is inevitable also in testing large groups with the Snellen test, unless the test is done with less haste than that usually employed, that some errors will be made. On re-examination, some individuals whose original test showed a visual acuity of 20/30 or even 20/40 may be found to have 20/20 vision. It is important to keep in mind these limitations and possible causes of misinterpretation of this test.

At the University of Minnesota the vision of all entering students was tested on the Snellen Chart. In the College of Education and the Medical School, complete physical examinations which include the Snellen test are required not only on entrance but also before graduation.

An analysis of the results of the Snellen test done on 1000 university students at the time of entering the university and again at the end of four years has been made. The material which has been collected will be presented under four headings: (1) the visual acuity of college students at time of entering the university; (2) changes occurring in visual acuity during four years in college; (3) the relation between eye symptoms and visual acuity as measured by the Snellen test; and (4) the relation between visual acuity and academic achievement.

The vision testing was done at the entrance examination either by a nurse or a senior medical student, while the tests were done by a nurse in the senior examination. The vision was recorded as

20/20, 20/30, etc. In this paper a vision of 20/40 means 20/40 in one eye and 20/40 or better in the other eye.

These data are based upon vision tests with the Snellen chart without glasses. It does not mean, therefore, that all students showing visual defects are necessarily handicapped by these defects, as many students had been fitted with glasses before coming to the university and others procured them during their university career.

TABLE I.—VISUAL ACUITY OF 1000 UNIVERSITY STUDENTS GIVEN SNELLEN TEST

Vision	Entrance Examination		Senior Examination	
	Number	Per cent	Number	Per cent
20/20	524	52.4	511	51.1
20/30	264	26.4	195	19.5
20/40	30	3.0	55	5.5
20/50	26	2.6	25	2.5
20/70	25	2.5	46	4.6
20/100	43	4.3	37	3.7
20/200	59	5.9	73	7.3
20/—	29	2.9	58	5.8
	1000	100.0	1000	100.0

The visual acuity according to the Snellen test of 1000 university students at the time they entered the university and at the end of the senior year is presented in Table I. The vision recorded is without glasses. There are about an equal number of men and women in the group and, since it was found that there were no significant sex differences, the data are presented without sex designation. Of the 1000 students, 52.4 per cent had 20/20, or so-called normal vision; 18.2 per cent had a vision of 20/50 or less. Collins and Britten[2] classify this as markedly defective vision. In the examination of 894 male industrial workers between the ages of 20–24, they found 9.6 per cent with a vision of 20/50 or less, or about one-half the frequency found in university students.

At the time of the senior examination there was a slight decrease in the proportion of students with a 20/20 or 20/30 vision while the

[2] *Ibid.*

proportion with a vision of 20/50 or less had increased from 18.2 per cent to 23.9 per cent.

In order to obtain a better picture of the change in vision in this group of university students they were divided into three groups: "A"—those showing no change or a decrease in vision of one line in one eye on the Snellen chart during the four years in college; "B"—those showing a decrease in vision of one line in each eye or two lines in one eye; and "C"—those showing a decrease in vision of two or more lines in each eye or 3 or more in one eye.

TABLE II.—DECREASE IN VISUAL ACUITY DURING FOUR YEARS IN COLLEGE AS MEASURED BY THE SNELLEN TEST

	Number	Per cent
A No change or slight decrease	790	79.0
B Moderate decrease	61	6.1
C Marked decrease	149	14.9
Total	1000	100.0

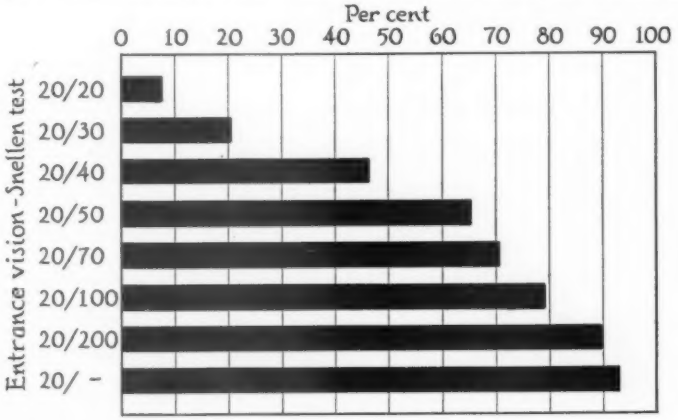
Table II presents these data. Of the group, 79 per cent had no change or very slight decrease in vision according to the Snellen test; 6.1 per cent a moderate decrease; and 14.9 per cent a marked decrease in vision.

TABLE III.—DECREASE IN VISUAL ACUITY DURING FOUR YEARS IN COLLEGE IN RELATION TO VISION AT ENTRANCE AS MEASURED BY THE SNELLEN TEST

Entrance Vision	No Decrease		Moderate Decrease		Marked Decrease	
	Number	Per cent	Number	Per cent	Number	Per cent
20/20 or 20/30 Total—788	680	86.3	52	6.6	56	7.1
20/40 or 20/50 Total—56	28	50.0	6	10.7	22	39.3
20/70 or more Total—156	82	52.6	3	1.9	71	45.5

The decrease in visual acuity during four years in college in relation to the vision on entering college is presented in Table III. The group having the lowest visual acuity when entering the university had the most marked decrease in vision at the end of four years. The majority of these students were undoubtedly myopic, a type of refractive error which is frequently progressive. It is significant also that 7.1 per cent of the group with a 20/20 or 20/30 vision at entrance had a marked decrease in vision. It is unfortunate that we do not have the results of a complete ophthalmological examination to give us information about the actual changes responsible for this loss of visual acuity.

CHART I.—STUDENTS HAVING GLASSES WHEN ENTERING THE UNIVERSITY



Of the 1000 students in this group, 257, or approximately one-fourth, had glasses when they entered the university. The percentage having glasses in each vision group is shown in Chart I. It is evident that the less the visual acuity, the greater is the percentage who have made an effort to secure correction with glasses. Whether this step-like increase in the number wearing glasses represents a true picture of the need for refraction in each vision group, or is due partly to the fact that in vision testing in the lower schools the student with the greater visual impairment according to the Snellen test is the one advised to have a refraction, it is impossible to know.

The importance of eye symptoms as an index of probable refractive errors, in addition to the Snellen test, has been emphasized, especially with younger children. It seemed probable that in university students symptoms related to the eyes might be some indication of visual defects. In the history which is taken at the time of the entrance physical examination at the University of Minnesota the student is asked to check if he has any of the following symptoms related to the eyes: aching eyes, eyes sensitive to light, inflamed lids, styes, blurred vision without glasses, blurred vision with glasses, double vision. Of the entire group of 1000 students, 43.4 per cent checked one or more of these symptoms.

CHART II.—STUDENTS GIVING HISTORY OF SYMPTOMS RELATED TO THE EYES WHEN ENTERING THE UNIVERSITY

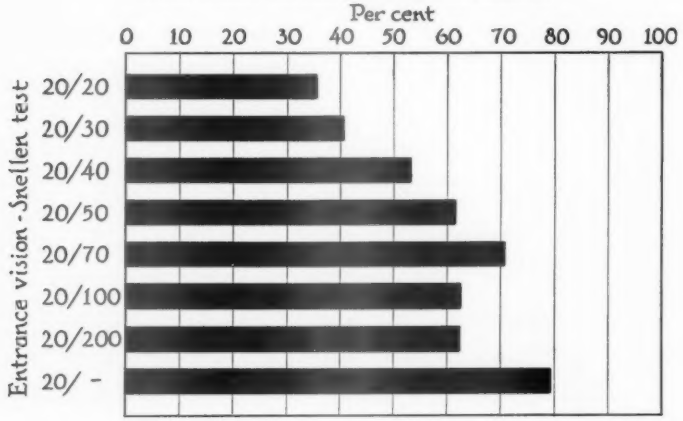


Chart II shows graphically the percentage of students in each vision group who had checked one or more symptoms related to the eyes at the time of the entrance examination. As one would expect, a greater percentage of those students with the lowest visual acuity had symptoms referred to the eyes. However, it is of interest that 35.9 per cent of those with a 20/20 vision and 40 per cent of those with a 20/30 vision complained of eye symptoms. Since it is a natural tendency to advise students with a vision of 20/40 or less to see an ophthalmologist and to consider the vision of 20/20 or 20/30 as within normal limits, the fact that 35–40 per cent of these

so-called normal students complained of eye symptoms would indicate that probably greater attention should be given to this group.

Evidence that eye symptoms in college-age students should receive more consideration is presented in Table IV.

TABLE IV.—HISTORY OF EYE SYMPTOMS IN RELATION TO VISION TEST IN STUDENTS FITTED WITH GLASSES AT THE HEALTH SERVICE

Vision	Number Fitted With Glasses	History of Eye Symptoms	
		Number	Per cent
20/20	74	42	56.8
20/30	62	34	54.8
20/40	12	8	66.7
20/50	10	6	60.0
20/70	9	6	66.7
20/100	23	16	69.6
20/200	26	15	57.7
20/—	13	10	76.9
Total	229	137	59.8 (average)

Of the 1000 students, 229 in the group were examined by an ophthalmologist at the Students' Health Service and glasses were prescribed at some time during their four years in the University. The percentage having symptoms related to the eyes was almost as great among those with a 20/20 or 20/30 vision as among those with lower vision. The 20/20 group and the 20/200 group had approximately an equal percentage with eye symptoms. There is but little doubt that a careful consideration of eye symptoms, especially in students in whom the Snellen test reveals a 20/20 or 20/30 vision, will aid in selecting those who should be referred for further study.

Further evidence of the importance of eye symptoms is shown by the fact that the students who showed the greatest decrease in visual acuity during four years were the students who had the largest percentage of symptoms related to the eyes when they entered the university.

The interest of colleges and universities in the performance of visual tests and in the correction of visual defects is to prevent and

remedy handicaps which might interfere with the health and academic achievement of the student. Although the question of the relation between visual acuity and success in school is not strictly related to the subject of this discussion, it is of interest to all people engaged in educational work. Therefore certain data pertaining to this were collected and will be presented.

All freshmen students entering the University of Minnesota are given a College Ability Test which is supposed to give an index of the student's aptitude for college work. Students ranking in the upper quartile in this test are far more apt to succeed in college than those in the lower quartile. The ranking in the College Ability Test was obtained on 378 of the 1000 students included in this report and tabulated according to the vision test on entrance to the university. This is presented in Table V.

TABLE V.—COLLEGE ABILITY TEST IN RELATION TO VISION IN 378 STUDENTS

Vision	College Ability Test							
	75–100%		50–74%		25–49%		0–24%	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
20/20 or 20/30	71	73.2	73	75.3	79	84.0	82	91.1
20/40 or 20/50	3	3.1	5	5.2	5	5.3	2	2.2
20/70 or worse	23	23.7	19	19.6	10	10.6	6	6.7
Total	97	100.0	97	100.0	94	100.0	90	100.0

In this test, 23.7 per cent of the students in the upper quartile, had a vision of 20/70 or less while only 6.7 per cent of those in the lower quartile has such low visual acuity. Although the number in each group is small, applying the Chi square test it is found that there are 249 chances in 250 that this difference is real and not due to chance alone. In other words, a larger percentage of those students with the best chance of succeeding in the university had lower acuity of vision than did those with the least chance of scholastic success.

That this prediction is apparently true is shown in Table VI, which presents the scholastic achievement of 194 medical students in relation to their vision on entering the medical school. The scholastic achievement is the average of all grades during the four years in the medical school. Those students ranking in the upper one-fourth of the class are compared with those in the lower one-fourth. Of the students standing in the upper fourth of the class, 31.7 per cent had a vision of 20/70 or worse, while only 11.5 per cent of those in the lower fourth of the class had as low vision. There are 19 chances in 20 that this is a real difference.

TABLE VI.—SCHOLASTIC ACHIEVEMENT AND VISION OF 194 MEDICAL STUDENTS

Vision	Scholastic Ranking in Class			
	Upper One-Fourth		Lower One-Fourth	
	Number	Per cent	Number	Per cent
20/20 or 20/30	25	61.0	49	80.3
20/40 or 20/50	3	7.3	5	8.2
20/70 or worse	13	31.7	7	11.5
Total	41	100.0	61	100.0

Thus, both in the prediction for success in college as measured by the College Ability Test and in actual achievement, a greater percentage of the higher ranking students were found to have markedly defective vision than of the lower ranking students.

Without doubt, the majority of students with a vision of 20/70 or worse are myopic. Why the individual with myopia should be a better student than one with normal vision is not entirely clear. It may be that because of the myopia, the student has been unable to succeed in games and sports as well as the child with normal vision and therefore has turned to books as a substitute and thus has developed habits of reading and study which are superior to students who have a broader field of activity.

That continued use of the eyes for close work may be a factor in producing myopia or in the progression of an already existing myopia is accepted by many. In this group the defective vision in

the better students may, therefore, be the effect rather than the cause of studious habits.

Another possible explanation may be that the student with a 20/20 or 20/30 vision may actually have a hyperopia of sufficient degree to make close work difficult and therefore the amount of time spent on study may be much less than that spent by the myopic student for whom reading usually causes no discomfort. An analysis of the eye symptoms in the medical students with a 20/20 or 20/30 vision showed no difference between those ranking in the upper fourth and those in the lower fourth of the class, leading one to doubt this last supposition. Whatever the explanation, the nearsighted student seems to succeed better in university work than the student with so-called normal vision.

Summary

In summarizing, the following points are emphasized:

1. Of 1000 University of Minnesota students tested by the Snellen test at the time of entering the university, 52.4 per cent had a 20/20 or so-called normal vision and 18.2 per cent a visual acuity of 20/50 or less.

2. The same group of students given a Snellen test at the end of four years in the University showed 23.9 per cent with a visual acuity of 20/50 or less.

Of the entire group, 14.9 per cent had a decrease in vision of two or more lines on the Snellen chart in each eye or three or more in one eye.

The students having the lowest visual acuity when entering the university had the most marked decrease in vision at the end of four years.

3. Eye symptoms are important in selecting students who should be referred for further examination. Of 229 students fitted with glasses at the Students Health Service, almost as great a percentage of the students with a 20/20 or 20/30 vision had complained of eye symptoms as of those with marked decrease in visual acuity according to the Snellen test. It should be remembered that the Snellen test will not detect many cases of hyperopia or moderate astigmatism.

4. In a College Ability Test given to 378 students in this group when they entered the university and in the scholastic achievement of 194 medical students at the end of four years in the medical school, the highest quartile in each group contained a significantly greater percentage of students with a vision of 20/70 or worse than did the lowest quartile. The better students had the poorer eyes.

Congenital and Hereditary Diseases of the Eye*

E. Clifford Place, M.D.

CONGENITAL and hereditary diseases account for about one half of all blindness; many of these diseases could be reduced through intelligent medical and public co-operation

WHENEVER I see a person of 70 years of age or thereabouts, whose appearance and tissues and eyes resemble those of one ten or fifteen years younger, upon questioning I am likely to find that his forebears were long-lived and robust on either the maternal or paternal side or both. And it causes me to think, and often to say, "How wise it is to choose good ancestors!" But if this be but a pleasantry, its corollary, namely, "How wise for ancestors to choose good offspring," may well have practical value!

It was interesting to read in two recent issues of the magazine, *The New Yorker*, of an interview with some of the survivors of the Oneida Community, that unusual experiment in communism and eugenics which flourished in New York State for a time in the past century and in which, of 58 births, only four were unplanned. It appears that all the descendants of this experiment were unusually vigorous, intellectually and physically, and though I know of no statistics about their eyes, I have no doubt these were as healthy as the rest of their bodies.

One hears but little of eugenics nowadays and it is rather a pity. Legislation, which influences the conditions for marriage in some states, may not go a long way towards improving the race; but

* Presented at the Institute on Conservation of Vision, Brooklyn, N. Y., April 16, 1936; arranged by the Bureau of Prevention of Blindness of the Division for the Blind, New York State Department of Social Welfare; and sponsored by the Eyesight Conservation Committee of the Brooklyn Health Council; Medical Society, County of Kings and Academy of Medicine; and the Brooklyn Ophthalmological Society.

education can be the potent factor to aid in influencing human beings to give some of the thought to the propagation of the race that they give to the breeding of cattle, horses and dogs. A knowledge of some of the congenital and hereditary defects of the eye may well help to stimulate such thought, for of all the organs of the body, people are likely to cherish their eyes the most.

Though the fertilized ovum is but a single microscopic cell, in it are all the potentialities of character and physique, good and bad, which derived from countless generations before it. It is fascinating to think of and to speculate as to how this tiny bit of protoplasm can hold such manifold possibilities. To quote, "The inexplicable and unknown have ever had a charm for theorists, and a search for a satisfactory explanation of congenital defects has been productive of many hypotheses."

This single cell multiplies by dividing, which sounds like a paradox. It breaks into two cells; each of these divides into two others and so on, until the billions of cells of greatly differentiated types finally become a human entity. Of them all, the cells which develop into the eye are among the most highly specialized and hence most likely to be profoundly affected by influences of temperature, drugs, chemicals, nutrition and disease. To quote again, "The normal development of the eye in its various parts is so exquisitely timed and ordered that a hesitancy at one point or the persistence past its allotted time of a temporary fetal structure at another point may so unbalance the normal procedure that a recognizable defect is produced in the completed eye."

Congenital defects need not be hereditary, nor are hereditary defects necessarily congenital in the sense that they are present at birth. In the first place, many congenital defects are present in individuals in none of whose ancestors can similar defects be found. On the other hand, many hereditary eye conditions are not present at birth, such as squints, cataracts, optic atrophies, and the like, but they develop later and in some cases only in mature and late life. They are nevertheless hereditary if similar eye defects occur in previous generations in the same family. Similarly, many diseases which we consider congenital are not present at birth—ophthalmia neonatorum, interstitial keratitis, etc.—but they are latently present and unfold in time.

Congenital and Hereditary Blindness in Children

In a recent study and report on *The Causes of Blindness in Children*,* Dr. Conrad Berens reported an analysis of 2702 children in schools for the blind. He classified them as to age distribution, amount of vision remaining, etiologic cause, and topographic cause, that is, the cause with relation to the part or parts of the eyeball involved. This report indicated that of these 2702 cases, more than half—51.1 per cent—of the blindness was due to congenital and hereditary causes. This gives to a consideration of the subject a weight which cannot be much diminished by the fact that probably a good many of these cannot be eliminated. Accidents and arrests of development will very likely always occur; nevertheless, a goodly percentage will remain, which by education of both the profession and the public can be avoided.

Some further statistics in this report are interesting. It discloses that 31 per cent of the cases were due to disorders of the entire eyeball, developmental anomalies, such as megalophthalmus (large eyes), microphthalmus (tiny eyes), albinism and refractive errors. Sixteen per cent had optic nerve defects, of which half were congenital and hereditary; 15 per cent had cataract; and 10 per cent were the result of ophthalmia neonatorum, whereas but two per cent were directly due to syphilis. I say directly because the suspicion that syphilis was a factor enters into the causes of many other of the defects.

The explanation of ocular anomalies is still in a highly theoretical state. By some they are considered purely developmental—a lack, an arrest or a maldevelopment; to others the answer lies in intrauterine inflammation, and still others believe both are responsible. The last seems to many the most logical explanation. In the purely hereditary defects, neither factor would seem to be involved, for here the knowledge of the defect, if one may put it in that way, is inherent in the germ cell and will usually influence the formation of the defect, regardless of other factors, in accordance with Mendelian laws.

Congenital eye defects are frequently multiple and are often

* Berens, M.D., Conrad, Kerby, B.A., C. Edith, and McKay, B.A., Evelyn C.: *The Causes of Blindness in Children*, National Society for the Prevention of Blindness, Inc., 1935, Publication number D-85.

associated with variations elsewhere in the body—microcephalus, harelip, cleft palate, spina bifida, etc. Colobomas of iris, ciliary body, retina, nerve and choroid are commonly found together, though they may exist singly. The term, coloboma, is derived from the Greek and means a congenital fissure. It is a fairly common fault and occurs in either lid as well as in the lens and other structures mentioned. While in the lid plastic surgery may accomplish a good deal, nothing can be done for a coloboma elsewhere in the eye.

Babies have been born without eyes, or with microphthalmia—rudimentary eyes. Others have megalophthalmus, one form of which is better known as buphthalmos or infantile glaucoma. In this condition all the eye structures are larger than normal, resembling an ox eye, and the thinned and stretched sclera permits the underlying choroid to show, coloring the sclera a grayish blue. This may be unilateral but is often bilateral and generally leads to serious visual defects. It is frequently hereditary as well as congenital. Treatment is unsatisfactory. The etiology is unknown but a recent writer suggested a possible hook-up between thymus hyperactivity and buphthalmos.

The eyes of healthy babies frequently suffer violence in the perilous passage of the baby to the outer world at the time of birth. The head is compressed and molded by various forces during this period and Rowland in 1927 studied the eyes of 400 infants within the first 24 hours after birth. He found 11, or 2.75 per cent, with scattered hemorrhages in the retina, 194 with hazy optic discs and 31 with lesions other than those of the eyes. He was able eight years later to report on the condition then of 17 of these babies and at that time all of these cases had cleared up, showing no trace of any lesion attributable to the birth injury.

However, birth injuries do cause permanent lesions which must be classed as congenital. A central hemorrhage—one in the macula—is likely to leave a permanent fault in the vision by destroying the delicate retinal elements at this point. Hemorrhages in certain parts of the brain and nerve sheaths will affect vision as well as the nerve control of various of the eye muscles, producing partial or complete paralysis and hence strabismus of the paralytic type. Add to these the direct injuries occasionally produced by forceps

in instrumental deliveries, and permanent lesions of the cornea, lids and muscles will add to the total of this source of congenital defects.

Edgerton, in 1934, writing on the same subject, spoke of contributing causes of brain and retinal hemorrhages in the newborn. He reminds us that premature infants are more disposed to hemorrhage as the blood vessels are weaker and more vulnerable. Since calcium is an important factor in the coagulation of the blood, a maternal deficiency in this element is significant. Here dietary errors must be considered as well as a deficiency of parathyroid secretion which has to do with the metabolism of calcium. Chief among dietary errors are those which provide a deficiency in vitamin B. Contrary to its habit with vitamin A, the body stores little of vitamin B; hence, it must be a part of the daily diet. Its prominent sources are milk, eggs, vegetables, cereals, liver and kidneys.

Edgerton further mentions syphilis as a cause of weakness in mother and child, with fragility of the blood vessels.

Vitamins

At this point it may be well to mention some reports in the literature bearing further on the relation of the vitamins to our subject. O'Brien, in a recent communication, gives the details of some experiments with white rats, in which besides general growth variations, he was able at will to produce cataracts by feeding a diet free of vitamin G found in yeast, rice, wheat, fresh meats and green leaves. Hale, at the Texas Agricultural Experiment Station, experimented with pigs. In the course of an investigation of the effects of vitamin A on swine, he fed a gilt, which is a young sow, a vitamin A free ration for 160 days before breeding and for the first 30 days after breeding. She farrowed a litter of 11 pigs, all of which were born without eyeballs. Interested in this phenomenon, he reproduced the occurrence twice in subsequent experiments. One case was particularly interesting. The preliminary period of vitamin A free feeding was for the purpose of depleting the animal's tissue of this vitamin which, unlike vitamin G, is stored in the body. In this test two gilts were studied. On the 176th day of preliminary feeding one of the gilts was so affected

that she was unable to get up. A two-ounce dose of cod liver oil was given her and within eight hours she was able to walk. When these animals farrowed, the one who had received no cod liver oil produced ten pigs, none of whom had any eyes, while the one who had received the one dose of cod liver oil produced a litter of 14, all of whom had varying eye defects. Some had no eyes, some one eye, some with one large and one small eye, but all were blind. Thus he concludes that a maternal deficiency, even in the human race, in vitamin A may suffice to produce congenital eye defects; and that we may have been forcing our spinach on the wrong victim; it ought to be administered to the mothers instead of the children.

That vitamin A exerts a powerful influence on the eye has long been known but this article evokes new interest in its possible effects on the development or maldevelopment of the eye. Blegvad in 1924 gave an exhaustive report on a series of cases of xerophthalmia, keratomalacia and hemeralopia which occurred in Denmark from 1909 to 1920 due to low economic conditions prevalent at that period. He states that the primary source of vitamin A is in green leaves of plants—not in vegetables, oils, tubers, etc.—while it is abundant in butter, milk, eggs and cod liver oil. Thus this fat soluble vitamin is generally found in connection with fats and is stored in the body in the reserve fats thereof, and so he reasons that a too great abundance of carbohydrate in the diet may be bad as it impedes this mobilization. Margarine, especially vegetable margarine, contains little vitamin A. Thus it was a prolonged diet deficient in this vitamin which was the cause of the eye diseases mentioned above. There is a reserve supply kept in the system of the gravid or nursing mother but if the proper food is not taken for a long time, this reserve is depleted and the mother and child suffer. Thus the eye economy of the unborn child may be affected by a deficiency diet in the mother.

Ptosis

Ptosis is a not uncommon congenital affection, involving one or both eyes, and indeed it may be hereditary as well. It may occur alone or be accompanied by paralysis of one or more of the muscles which move the eye, in which case there will be convergent or

divergent squint or a difference in level of the two eyes. It may occur as a developmental or hereditary defect or may be the result of pressure, either natural or by instruments during birth. It is quite disfiguring, the drooping of the lids, especially when bilateral, causing the patient to go through life with his forehead wrinkled and head thrown back in order to peer out beneath this paralytic curtain. Although this is less true if the affection be onesided, nevertheless it gives a rather sinister cast to the expression.

I remember very well a young man of about 27 upon whom I operated some years ago for bilateral ptosis. He had gone all these years with the handicap described above and in addition the weight of his lids made him go to sleep on reading or even at the theatre. But at this time he married and then the situation changed. No longer was he to be permitted to spend his evenings in somnolence; so at the urging of his new wife he permitted the operation. It was fortunately as successful as these cases can be and henceforth he was able to face the world with level gaze and to keep awake when social amenities required it. Operation in these cases, though functionally successful, is not always perfectly so cosmetically. But it is a great help.

Strabismus

Other muscle affections which are congenital, hereditary or both, are the great groups of strabismus of various kinds. When paralytic, it is present at birth and noticeable after the first few weeks when the child begins to be able to fix its eyes upon objects. In the other more usual types, the conditions are present but latent, to develop into squint when the child begins really to use its eyes, especially for close objects—pictures, books, toys, etc. Many times, upon questioning the parents, one learns that the father had a turn or a cast in his eye as a boy, or an aunt, uncle, or a grandparent. People really should be more careful whom they marry if they expect to bear physically perfect children. In some cases what should be a muscle is found to be a firm cord of fibrous tissue, a developmental defect definitely limiting the excursions of the eye. Treatment with exercises, glasses and operation is effective in the ordinary type of squint but useless in this particular form.

Blindness Due to Syphilis

Aside from the opacities of the cornea resulting from interstitial keratitis, due mostly, as I have said, to congenital syphilis and developing some time after birth—I have now under my care a man in his late twenties with interstitial keratitis—aside from these, babies are occasionally born with cloudy corneas. The visual defect occasioned will naturally depend upon the location of the opacity, whether in the pupillary area or not, and upon its size and density. Some are thought to be due to intra-uterine inflammation and others to adhesions and late separation of the cornea from other parts during development. They are often associated with other defects—dermoid tumors, colobomas, etc.

Ophthalmia Neonatorum

Ophthalmia neonatorum, "babies' sore eyes," has been known for centuries. Between 7 and 10 per cent of all blindness is the result of this infection. Babies acquire this from the birth canal of an infected mother during delivery. Typically, such a baby will appear normal at birth but in from one to ten days the lids will swell, redden and from between them will exude thick yellow pus. The swelling of the lids is such as to seal the eyes so that when they are forcibly separated for treatment and inspection, the dammed back pus may occasionally spurt forth into an eye of the luckless attendant. More than one nurse has thus been infected; and deadly as this disease is to a baby's eye, it is even more so to an adult's.

The gonococcus readily attacks and invades the cornea, producing ulcers, infiltration and perforation. Thus the final result is a deeply scarred and opaque cornea, and often a deformed and shriveled eye—sightless in either case. Both eyes are generally simultaneously involved.

Cases occur, however, in which this classical picture does not present itself. I recently saw a case at the Methodist Hospital—there have been only two or three there in years—in which there was no lid swelling and the pus was thin and watery. Here the microscope alone must make the diagnosis in the early stage. However, the cornea, which became cloudy and ulcerated, was invaded just the same. The condition seemed to be under control

when baby and mother were transferred to a city hospital and I lost sight of them. I hope it continued to improve. The significant feature of this case for us is this: the Methodist Hospital runs a well staffed, well equipped and well attended prenatal clinic. Here many women come as early as their third month of pregnancy for advice and guidance. The blood of every one of them is subjected to a Wassermann test and in any who give a history of venereal infection or who have a vaginal discharge, a microscopic examination of a smear is made. If these tests prove positive, corrective treatment is instituted and when this is properly carried out, a healthy baby may be, and is, expected. This particular mother was what they call a "walk in case." She walked into the hospital for the first time when in actual labor and no prenatal care could be given. The last case of gonorrheal ophthalmia that I saw in the same institution was in a similar situation. This one was an unmarried mother, who was infected and had no prenatal care; both the baby's eyes were lost. The child was premature and hence its tissues were an easy prey to the gonococcus. These are significant facts in prevention of this scourge. The prenatal clinics are accomplishing wonders in the care of expectant mothers and the prevention of these as well as other serious troubles for the little lives they carry.

The iris has been mentioned: it may be the subject of a coloboma, holes may exist, the pupil may be deformed, or no iris at all may be found—aniridia with amblyopia and nystagmus. Iritis, if present at birth, is believed to be syphilitic in origin. The other faults are accidents of development.

Affections of the Crystalline Lens—Cataracts

The crystalline lens is a fertile field for these affections which we are discussing. It is an important structure in the economy of the eye, its usefulness depending upon its having the proper shape, position and transparency. Hence disturbances here lead to serious visual defects. The lens may be notched, which is not so bad; it may be displaced, upward, outward, or both, not often downward, or it may be clouded, in part or in whole. Displacement, called ectopia, interferes with the proper focusing of light on the retina and if the displacement is great enough to bring the

edge of the lens into the pupil, there will be no focusing at all of light which passes through part of the pupil, except that inadequately provided by the cornea. People with this condition are likely to have vision reduced to 20/200 or 20/100. Lloyd has recently described anew a familiar group of defects labelled arachnodactyly, in which dislocated lenses are prominent features, together with very long and thin bones, heart disease and tiny pupils. It is an hereditary affection. Opacifications of the lens are called cataracts and may vary in location and extent. A small spot may exist on either the anterior or posterior surface, generally in the center, and thus form either an anterior or posterior polar cataract. Since it is in line with the center of the pupil, some disturbance of vision will naturally result and the degree of dimness will depend upon the size and density of the spot: vision under these circumstances may vary from 20/30 to 20/200 or even less. Operation is likely to give considerable improvement in the bad cases but in those whose vision is as good as 20/40 or 20/50, it is usually advisable not to operate. Another common form is zonular or lamellar cataract in which a clouded disc is present in the center of the body of the lens. The same statements as to vision and treatment hold true for these as for the types mentioned above. If not operated upon, these cataracts remain stationary, so that the vision does not deteriorate. Some of these cases are merely congenital; others are hereditary.

There is, however, a definite hereditary tendency to cataract of the senile type in some families. Vinsonhaler, in reporting on six generations of such a family in which the age of the individuals at the time of development of the cataract varied from as great as 70 to as young as 27, stated again Nettleship's rules in these families as follows:

1. Descent is direct. No generation is skipped;
2. If all children in one family have cataract, the liability of the next generation is increased;
3. Transmission from like sex to like sex is most common;
4. The cataract tends to appear earlier in life in succeeding generations;
5. The age of onset is approximately the same in persons of the same generation;

6. The families with cataract are not affected as to fertility, health or longevity.

One further fact about cataracts: Pagenstecher has produced congenital cataracts in rabbits by feeding naphthalin, which indicates that a toxic origin may be a possibility in some of our cases.

Other Affections Due to Maldevelopment or Heredity

It would be wearisome to enumerate and describe in detail the affections of all the ocular tissues which maldevelopment and heredity may produce. They are legion. A few of the interesting ones remaining will suffice. Hereditary optic atrophy or Leber's disease is one. Its inheritance is sex limited, that is, it is transmitted through females, but affects only males. The same peculiarity features color blindness—women rarely suffer from it, but their sons do.

Nystagmus.—This is the term for dancing eyes, which we not uncommonly see. The eyes oscillate, rapidly or slowly, horizontally, vertically or in a rotary fashion. It is associated with some cataracts, aniridia and other lesions, while in some babies no physical cause can be seen. Moorad, in a recent communication, states that nystagmus generally shows itself first at the age of six or seven months, that it seems to occur more often in the homes of the poor and in the winter months, where and when there is lower illumination. He suggests as a possible help in treatment greater illumination.

Albinism.—Albinism, where the bleached iris and retina cause diminished vision, often with nystagmus, occurs but is not common. Consanguinity in the parents is thought to be a factor in some cases.

Refractive Errors.—These are commonly handed down from one generation to another. This is particularly so in myopia and in high degrees of hyperopia and astigmatism. In my experience, inherited myopia is not apt to be seriously progressive unless it be of high degree. Progressive myopia seems to be an acquired disease and frequently occurs in children whose parents have good eyes.

Glioma.—Glioma is fortunately not common but may affect both eyes. It is a form of cancer usually originating in the retina,

which by its growth destroys the eye and by spreading through the body to other organs causes death. The early removal of the eye is an essential in the treatment. Heredity occasionally plays a part.

It not infrequently happens that the tear duct is obstructed at birth, either by a failure for it to grow completely down to the nose or by a plug of mucus and detritus. This leads to conjunctivitis and occasional formation of abscess in the tear sac. Many of these stenoses clear up spontaneously as the child grows and develops, but some do not. Fortunately, treatment is usually satisfactory and recovery prompt. An irrigation or dilatation of the duct done once or twice is generally sufficient.

Conclusions

1. Congenital and hereditary diseases account for about one half of all blindness.

2. Many of these defects cannot be cured or prevented by any means now at our disposal.

3. A goodly percentage remains which can be partly or entirely prevented by greater use of the knowledge and means now at hand.

Physicians should appreciate more fully the importance of early recognition and treatment of syphilis; the public should be taught the need of the blood test early in pregnancy or before: I say early because many of the important eye structures are formed in the first weeks of embryonic life. Public sentiment should be educated to prohibit the marriage of the hereditary blind. Prenatal clinics should be attended earlier and by more women. The same holds true in private practice. Nutrition is a factor in embryonic life and may greatly influence the development of the eye. Doctors, nurses, social workers and teachers can all aid in this program through their contacts with parents and their influence upon them. More thought should be given by young people to the subject of marriage and mating.

Conservation of Vision—Infant and Preschool Age*

Albert Frost, M.D.

THE author emphasizes the need of thorough medical eye care in children before they reach school age, especially in such cases as cross-eyes and congenital cataracts

AS you know, the oculist has very little opportunity of seeing children professionally—at least normal children—until after they have reached the school age, and in many cases, through neglect and ignorance, a great deal of valuable time is lost. I think that it is particularly appropriate that we try to present to your group which contacts so many people, including children, throughout the state, some of the problems that confront the oculist. I hope that you will be able to carry to those whom you contact, the message that after all it may be the safest thing to have every child's eyes examined early in life by a competent oculist, rather than to wait until the child is old enough to read before having his eyes properly examined. We find to our sorrow that many do not come for examination until they are older, when it is really too late to do very much.

Definition of Blindness

The definition of blindness is a rather obscure thing. The topic on the program is "Conservation of Vision," which, otherwise, may be stated as prevention of blindness. Blindness is after all only a comparative thing. Our definition at present is that any child who has less than 20/200 vision in the better eye is potentially blind. There are many deviations from this and yet figures that

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we obtain by the usual Snellen tests do, from a practical standpoint, constitute the best definition that we have for blindness.

Periodic Examinations

I want to speak particularly about what can be done to preserve or conserve vision from birth up until school age because this is a very important period. We have advocated programs for periodic health examinations for adults. It seems to me that there should be some effort made to have periodic eye examinations or, at least, one examination before a child reaches school age. Fortunately, most children have normal eyes and need no treatment. An examination of their eyes will happily show this; but many may show a degree of blindness in one or both eyes of which the parents have had no knowledge. In many of these cases the parents are surprised to discover on examination that the children have defective vision, which, if given early attention, may be improved. Sometimes, of course, nothing can be done, but it is a source of satisfaction to know that every opportunity has been provided for their care.

It is the duty of those interested in the conservation of vision and in the prevention of blindness to lend aid and give advice that will help children to be brought up in the world with normally functioning eyes. The axiom that "an ounce of prevention is worth a pound of cure" applies very appropriately to this type of program.

Sad to say, there is often no attention paid to the child's vision until he has reached school age, when the teacher may discover that he has defective vision, while through all these years the parents, or those to whom the child is entrusted, have never suspected that he had defective vision. It is surprising that parents will say, "Well, I never knew you could examine a child's eyes before he could read the letters." Of course, this false impression in the minds of many should be corrected. The time to begin the prevention of blindness program may even be before birth.

Hereditary Eye Diseases

We have hereditary anomalies, such as albinism, retinitis pigmentosa, dislocated lens, congenital cataracts and various other

anatomical defects. Instances of these anomalies may occur many times in a single generation and they have a definite tendency to be inherited. We have no laws to prevent marriage of these individuals, nor have we laws to permit sterilization or birth control. However, I have found that by proper advice and explanation to them of the cause of their blindness they will in their own way avoid having children. At present this is, I think, the only way to be of service in preventing the increase in the large percentage of blind that we have in the schools for the blind from congenital or hereditary causes.

Statistics have shown, in the last census that was taken, that 45 to 50 per cent of children in schools for the blind are there because of some form of hereditary disease. This percentage has increased in proportion to the decrease in the blindness due to some other types of disease. Another serious factor that we meet with in children particularly, and often in the early adult, is congenital syphilis. Very often apparently normal children go through many years of life without any ocular defect whatever and, suddenly, even in the later years, develop inflammation of the eye, which we recognize and diagnose as interstitial keratitis. This disease is due to congenital syphilis and the child is a sufferer through no fault of his own. It has been found that proper and prompt treatment of the mother for syphilis during pregnancy has done a great deal to lessen the incidence of interstitial keratitis or other ocular diseases.

We also are forced to believe that the proper treatment of children who have other signs of congenital lues, or who are born to parents who have the disease, is imperative. I think that available statistics will show that of those children of luetic parents that have been treated, very few develop interstitial keratitis. After the disease has made its appearance, it seems that anti-luetic treatment does little to lessen the severity of its course. We know that it usually begins in one eye, but in spite of all treatment, the other eye will also be affected.

One of the most unsatisfactory experiences in the treatment of these cases is due to the fact that frequently the parents become discouraged with the progress, or lack of it, and frantically change from one doctor to another. To avoid this experience, as soon as

the diagnosis is made, the cause should be carefully explained to the parents. They must also be advised as to the probable course and duration of the symptoms and that the other eye will become involved in spite of all treatment. In this way, better co-operation will be given and the best results obtained.

Ophthalmia Neonatorum

I am not going to dwell very much on the subject of ophthalmia neonatorum. It is a source of much satisfaction to see that after the general adoption of Credé's method of prophylaxis, the education of the laity, and the establishment of better methods for treatment of these cases in the early stages, we have had fewer and fewer cases of ophthalmia neonatorum come to the schools for the blind. However, our set-up is not ideal and we still have many cases that come from outlying portions of the state in which the case has not been reported early nor received early care. This has been due particularly to the fact that we have no place to send them, for no hospital will furnish free this expensive type of treatment. Through the efforts of the Ohio Commission for the Blind, we have, to a certain extent, been able to get proper treatment for these cases when they were reported. Blindness from this cause is preventable if prompt and efficient treatment is provided. From the standpoint of prophylaxis, the Credé method, with which you are all familiar, is almost infallible; but in spite of this prophylactic treatment, we do occasionally find cases of ophthalmia neonatorum occurring. These are probably due to faulty technique. Some cases have been reported in which the improper solution has been used, such as the accidental use of 10 per cent of silver nitrate instead of one per cent. However, if the technique is properly carried out in this prophylaxis, and if the immediate and proper treatment can be provided, ophthalmia neonatorum as a cause of blindness will be unheard of.

When to Take Preventive Measures

If the child has fortunately escaped having any inflammatory or other outwardly evident disease of the eye during infancy, are we through with our responsibility? Can we neglect the child's eyes until he gets to school where the teacher, the physician or nurse in

charge of examination of the children, will discover that there is some defect of vision? As I said before, I believe that all along the line any possible abnormality or complaint of the child should be investigated by an oculist because the prevention program begins when the complaint begins.

Most diseases in children, of course, are manifested and are easily seen but many ocular defects are not recognized; the child may go on with defective vision without any particular notice being drawn to it by the parents or by anyone with whom he may be in contact. We do not say that every child must have his eyes examined but I do not think we are in error in saying that it is an advisable procedure. Some parents do this and it is a source of much satisfaction to them, after examination, to know that their children have healthy eyes, that they have no great refractive error and are starting through life without any ocular handicap. Other parents may be made unhappy by the fact that something unfavorable is discovered regarding the eyes, of which they were not aware but which might have been worse if neglected.

Ocular Defects Unaccompanied by Outward Signs

Briefly, what are these ocular defects that we may find? First of all, without any outward appearance of any defect, we may discover refractive errors, the commonest of which is farsightedness. Farsightedness, if great, means a very short eyeball in which, no matter how much the child attempts to strain, a clear picture cannot be obtained on the retina. Consequently, everything seen is blurred.

When a child is born, the only visual ability his eyes have is, perhaps, to see light. Then, as the child grows a little older, he will see moving objects. A little later he will be able to recognize his parents and to distinguish them, perhaps, from someone whom he does not know. Gradually, through a period of months and years, the child develops what we understand as normal acuity of vision. If children have refractive ocular defects, such as farsightedness, in which, no matter how hard they try, they are unable to get a clear picture, then the proper function of the retina has failed to develop.

The same thing takes place in the eye of a child who has a uni-

lateral squint or cross-eye. The eye which is straight is the only eye which is used. The opposite eye being deviated in another direction, the image in it is disregarded; consequently, the function of that retina will not be properly developed. We call this amblyopia ex anopsia which means blindness from disuse. Many children with very farsighted eyes do not have a squint but are never able to get a clear image on the retina and, as a result, never develop good visual acuity. These children, if the condition is discovered early, will be enabled by the use of glasses to get a clear image and thus can develop normal acuity of vision. If this is neglected for a period of years—even until school life begins—then we have lost valuable time and the vision rarely develops to a normal acuity, even after the prescribing of glasses. The same thing applies to those cases of squint in which the deviating eye is never used although it could have been used if it had been taken care of early enough in life.

Now who should take care of these children? Many of the ocular conditions that we find may be related to some other medical condition, and the oculist will be able to interpret these and to correlate one with the other. The thorough knowledge of embryology which only the doctor has had in his medical school work, enables him to understand the congenital anomalies that we meet. The medical eye man (oculist) is interested in more than the selling of glasses and it would be, I believe, the practice of the medical eye man to avoid putting glasses on any child before school age, or at any time, unless he felt that the refractive error was great enough to warrant it and that glasses were going to accomplish the purpose for which they are intended. We have found a great many children who are wearing glasses needlessly. Glasses have been prescribed for many children who have come to the school for the blind with conditions in which glasses will not help at all but are the only instrument at the command of the man who does that type of eye examination.

The advantage of the use of drops, such as atropine or other cycloplegics to paralyze the ciliary muscle, the muscle of accommodation, is recognized particularly in children. We cannot do a satisfactory examination in a child without the use of drops, in spite of the propaganda to the contrary on the part of those individuals who are not permitted to use them.

Correct Age for Glasses in Childhood

A child is never too young to wear glasses if he is very farsighted or nearsighted to a degree which requires the glasses to enable it to get a clear image on the retina. If glasses are not worn in these extreme cases, the visual acuity does not develop. For example, the youngest child on whom I ever put glasses was ten months old and had a hyperopia of about six diopters. If that child had not early learned to see through his glasses, the visual acuity would not have developed, although there were no anatomical and no pathological changes in those eyes. The mother shortly discovered that the child would cry unless he had his glasses on. Of course, we do not prescribe glasses for such young patients unless there are very high refractive errors which, if uncorrected, would prevent the development of normal visual function.

The nursing profession can help to correct the false impression of parents and the laity that it is dangerous to have children wear glasses. Many people are impressed with the idea that if they play ball or other outdoor games, they may fall and break their glasses and have the glass go in the eye. I have never seen a child have his eyes injured from wearing glasses, but I have seen a good many children who, if they had worn glasses, would not have had the ocular injuries from which they suffered. Glasses are made sturdy enough for these children and if they really need them, there is no reason why the parents should fear that the glass will be broken and hurt their eyes. Any force which will break a glass by impact, will do far more damage to the eye if the glass is not there to serve as a protection. Goggles are worn to protect the eyes in industry, so why should they not furnish the same protection to the child?

Cross-Eyes

Of course, every child that has a deviating eye which we call a squint or strabismus, no matter how young, should begin to receive treatment immediately after the condition is noted. The treatment should be different for every type of squint. The competent oculist should be able to manage the case from its very incipiency on through perhaps several years and bring about what we understand as a cure. Neglected cases grow up with a blind,

useless eye which turns in; and with this cosmetic defect, the child's development in his contacts with others is bound to be affected: this may make him backward or make him rebellious. I know one little fellow who wants to fight every time anyone says anything to him about his eye. Others have the opposite temperament and are backward. I believe it is wrong to allow these children with deviating eyes to enter school where they will be subject to the ridicule of their playmates. The old idea was to let the squint go until the child grew older and then straighten the eye by glasses or surgery. A few types of squint can be corrected with glasses, but if the glasses do not immediately—or within a period of a few months—straighten the eyes and allow both eyes to be used together, they are not the only thing that is indicated. It is true that they are needed in a large percentage of cases. Whether there shall be an operation or whether there shall be a systematized form of exercise, will depend upon the particular type of case; but it is wrong to allow the child to go to school and mingle with others if the condition can be corrected by any of the means, including surgery, which can be used a considerable time before school age.

Congenital Cataracts

Just a word in regard to congenital cataracts, of which there is so much dispute. A congenital cataract is due to an opacity of the lens of the eye which has been influenced in its development some time during pregnancy. It has hereditary and familial characteristics but we do have cases appearing spontaneously and, usually, in both eyes. It is recognized, of course, in most cases by the appearance of a white pupil in a child, and a rather searching movement of the eye. The searching movement is an attempt of the child to see through the cataract which produces a fog and, as a result, good clear vision cannot be developed. After these movements have been established and the child has been handicapped by inability to see, the movements will continue. It is then too late to expect a good visual result from a cataract operation, even with a perfect surgical result. Congenital cataract should be operated as soon as the child is in good enough health to stand a very minor operation under general anesthesia. In this way, if we can get a good

clear pupil and allow the rays of light to enter through it with the aid of a correcting lens, the child theoretically should develop as good vision as any other child.

Sometimes there may be other defects in the eye associated with congenital cataract, such as a small, undeveloped eye, the microphthalmic eye, which, in the presence of a cataract, offers a fair prognosis for some vision if operated early. If they are not taken care of, the child will be totally blind and will not be able to even help himself around. We have several children in the schools for the blind who were operated on in infancy with this condition. They are still in the schools for the blind. Their vision is very markedly impaired but they are happy and able to get around, which they would not have been had they not had surgical attention.

Congenital cataracts neglected until late will develop the ocular nystagmus which I mentioned. There may be a successful operation but since the ocular nystagmus has developed, the visual function may not be as good as the successful operation might indicate.

Conclusion—Results of Neglect

I want to leave the message with you that every child has a right to have good ocular attention before he is old enough to request it for himself. A great many boys and girls have gone through high school, or even through college, without proper attention because their parents would not permit any surgery upon their eyes for the correction of squint. These young adults are then thrust on the cruel world with a terrific handicap and an inferiority complex. It is a pitiable condition in which some of them find themselves. Many want to have their eyes straightened so that they can go out and compete with others and carry on in the world. A person should never be forced to go through life, particularly in the school age, with that defect, any more than he should with a cleft palate or a harelip. Great things can be accomplished in this line if the patient is placed in the hands of the interested oculist who can properly take care of him, whether it be by refraction, exercises or by operation. For this reason we believe that the program for the prevention of blindness should be in the hands of someone who has the privilege and the right to prescribe medically or surgically for the patient.

Progress in the Use and Application of Photo-electric Cell Control*

Aksel J. C. Knudstrup

THE use of the photo-electric cell in controlling lighting in schoolrooms is an innovation which promises much practical application

Study of Natural Lighting in Classrooms

A GREAT deal of research work has been made on natural lighting and the difference in intensities of lighting in the typical classroom. The most exhaustive study is probably that of A. F. Beal of the United States Public Health Service,[1] the study made by H. H. Higbie at the University of Michigan,[2] and the study by James E. Ives and Frederick L. Knowles of the United States Public Health Service.[3]

If we refer to the results of the study made by Mr. Beal, we will find that the inside-outside illumination ratio is not constant but varies with the season, the hour of the day and the condition of cloudiness.

From the study by Professor Higbie on a model classroom, the variation of the lighting in the classroom proper, due to the natural illumination from windows on one side of the room, is shown to decrease very rapidly as the distance from the window increases.

From the study by Mr. Ives and Mr. Knowles it can be seen that the average sky-brightness of the clear north sky from 8:00 A.M. to

* Presented before the Thirtieth Annual Convention of the Illuminating Engineering Society, Buffalo, N. Y., August 31 to September 3, 1936.

[1] Beal, A. F.: *Studies in Natural Illumination in School Rooms.* Public Health Bulletin No. 188.

[2] Higbie, H. H.: Treating the Windows to Conserve Daylight, *Transactions of the Illuminating Engineering Society,* March, 1929.

[3] Ives, James E., Knowles, Frederick L., and Thompson, Lewis R.: *Studies in Illumination.* Public Health Bulletin No. 218.

4:00 P.M. varies from 219 candles per square foot in January to 550 candles per square foot in June. On cloudy days the average sky-brightness will naturally be very much less, the ratio, however, remaining the same.

It is readily apparent from the foregoing paragraphs that some sort of control of lighting should be made to compensate for these variations in natural lighting and the effect on the daylight illumination of the classroom. The photo-electric cell is the best control known at the present time to accomplish this.

Example of Control in Classrooms with Windows on One Side

Let us take for a concrete example a typical classroom with windows on one side controlled by means of the photo-electric cell. Let us assume that the photo-electric cell is set to turn on at 15 foot-candles and off at 45 foot-candles and that the illumination provided by the artificial lighting is 15 foot-candles. Then if the intensity should drop to 14 foot-candles, the light would turn on giving 29 foot-candles, and if the intensity went to 46 foot-candles the light would go off and the resultant illumination would be 31 foot-candles. Thus the intensity of illumination would always be kept above 15 foot-candles at the side of the room away from the windows and at the same time a more uniform illumination would be provided over the entire room.

An improved control to obtain constant lighting can be attained by controlling the inner and outer row of lights by two separate cells. The importance of controlling the inner row of lights on a separate cell and relay is readily apparent from the results obtained in the tests made by Professor Higbie on a model classroom. Taking as an example a classroom 20 feet deep and 30 feet long (parallel to the windows), the illumination drops off 81 per cent at a distance of 20 feet back in the room away from the windows, 52.3 per cent 10 feet back from the windows and 34.8 per cent 8 feet back from the windows. Thus if 15 foot-candles were provided for by means of the artificial illumination and 15 foot-candles of illumination were obtained 5 feet from the windows, only 2.85 foot-candles would be provided by natural illumination 20 feet from the windows, 7.15 foot-candles 10 feet from the windows and 9.8 foot-candles 8 feet from the windows. Now when the photo-electric

cell turned on the inner row of lights, a little over 15 foot-candles would be obtained over the entire room. To substantiate this hypothesis, tests were conducted in the Washington, D. C., schools and, to all practical purposes, the results proved the hypothesis to be correct. Furthermore, the results obtained by Professor Higbie in a model classroom were proven to be practically true in an actual classroom.

Tests Conducted at Henry School, Washington, D. C.

A study has also been made in the sight-saving classrooms of the Henry School in Washington, D. C., on methods of control. In these experiments it was found that in classrooms with windows on the north and east sides of the room the best control was had by placing the photo-electric cell about 7 feet from the floor on the west wall, 10 feet from the south wall. It was found that at this point the average illumination was most satisfactorily maintained constant throughout the entire room.

In this case the photo-electric cell relay was set to turn on the artificial illumination when the natural illumination fell below 10 foot-candles and to turn off the lights when the combined natural and artificial illumination reached 30 foot-candles. The artificial lighting provided for an illumination of 15 foot-candles.

The instructor of the sight-saving class states that since the photo-electric cell control has been installed in her room the results have been remarkable. She states that the ease of teaching has been increased materially, the students seem better satisfied and are more eager for knowledge. The natural result of the control of illumination by the photo-electric cell is the protection of the eyesight of the student.

Control by One Photo-electric Cell for All the Rooms on One Side of the Building

Also it is often possible to control the illumination on one whole side of the building with a single photo-electric cell. To do this the rooms must have the window exposures and areas and the shape and size of the rooms similar. Furthermore, the natural and artificial lighting conditions should be the same. When controlling a group of rooms by this method the cell should be placed where it will receive the best average light.

Summary

In conclusion, it can readily be seen that the control of artificial lighting by means of the photo-electric cell has many applications which certainly are beneficial to the student as well as the teacher. These benefits may be placed under the following headings:

1. Maintenance of more constant illumination in the classroom.
2. Maintenance of sufficient illumination in the classroom.
3. No classroom distractions due to teacher's having to turn on and off the lights.
4. Maintenance of a more even distribution of light in the classroom.

The value of these benefits is apparent to every illuminating engineer as they are fundamentals of better lighting.

In regard to the methods of control, it is apparent that where two sides of the classroom have window exposures the photo-electric cell can best be utilized by controlling all the lighting units at one time. On the other hand, with window exposures on one side only, the best and most economical results may be obtained by controlling rows of luminaires parallel to the inside wall. The controlling cell for the inside row of luminaires should be on the center of the wall, 8 feet from the floor. The controlling cell for the outside row of luminaires should be suspended from the ceiling, 8 feet from the floor in the center of the room. To have one control for an entire side of a building, the controlling cell should be placed on the lower floor, or, in other words, the light collector cell should be placed where it will receive the best average light. It is also possible in groups of rooms with the same natural lighting conditions to control them by one cell. These rooms may be selected by using a light meter to determine which rooms have the same amount of natural light at identical times. In this case, measurements should be taken on the dark side of the rooms.

Editorial

National Social Hygiene Day

ON February 3, 1937, concerted action, sponsored by the American Social Hygiene Association and many co-operating agencies, in approximately 100 communities throughout the United States, will bring to public attention two of society's greatest enemies: diseases which leave in their wake blind, deaf, crippled or otherwise disabled human beings. For years these diseases have been linked as venereal, but doctors know them as the communicable diseases, syphilis and gonorrhea.

Nearly 30 years ago, the National Society for the Prevention of Blindness began a war against ophthalmia neonatorum (babies' sore eyes)—a disease causing blindness to the newborn, through the presence of germs in the birth canal of the mother. Although the use of prophylactic drops at birth was known to be an almost infallible preventive, it was not until their use was made mandatory that the incidence of blindness caused by ophthalmia neonatorum began to drop, until now it has been reduced more than 75 per cent.

Today the National Society for the Prevention of Blindness feels that the problem of blindness or damage to vision from syphilis must be attacked with the same concerted vigor that resulted in the phenomenal reduction of ophthalmia neonatorum. It is an established fact that prospective mothers who have syphilis can bear healthy children if prenatal antisyphilitic treatment is administered in time. A blood test is the universal method of determining the presence of syphilitic germs. The Society therefore joins all interested agencies in sponsoring measures which make it mandatory for routine blood tests to be made on all expectant mothers by their physicians—whether they be private or clinic patients. By discovering, and following up with treatment, all syphilitic expectant mothers, we may hope for a marked decrease not only in blindness and defective vision but in human misery and wretchedness, if not utter tragedy.

In view of the close relationship between prevention of blindness and the campaign to "stamp out syphilis," we urge our readers to support National Social Hygiene Day and subsequent efforts to reduce the toll of suffering caused by this disease.

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

What the Community Should Know About Failing Vision*

Immutable, unrelenting time leaves its marks on the human body as it does on all other living things.

When the average person reaches the age of forty, a change takes place in his eyes; a dislike to do near work, a late afternoon or early morning headache, a tendency to hold small objects farther away, and occasionally blurred vision. Correctly fitted glasses permit close application with clear sight and without discomfort. The testing for glasses is a highly technical art and the one prescribing lenses must also be competent to render an opinion on the general health of the patient.

A complete examination includes the study of the background of the eye, the stage upon which many of the tragedies of life are enacted. It is now possible to make a photographic record which is of extreme value, for by it the past, the present, and the future ocular health can be told.

If a patient has to change his glasses frequently, it is an indication of either a constitutional or a local eye disease and calls for a searching investigation.

Widely heralded special forms of glasses have an extremely limited range of usefulness. Telescopic lenses and contact glasses are for rare conditions and will never take the place of properly fitted spectacles.

One frequent cause of failing vision is cataract. This is a clouding of the lens of the eye and may be of an isolated part, slowly progress, start and stop, or rapidly involve the entire structure. Babies may be born with cataracts and children may develop them during

* Reprinted, with permission, from the *New York State Journal of Medicine*, September 15, 1936.

the course of their growth, especially when undernourished. Some cataracts mature in a very short time, as for instance in diabetes and goiter. Others follow the ingestion of dinitrophenol, a drug which has an unwarranted reputation as a safe cure for obesity.

In some families cataracts appear early in life; in others, late. If the sight is poor, the cataract can be removed. After the operation serviceable vision is usually restored. The majority of those who have cataracts wear proper glasses and live without fear or apprehension of the future.

By means of a special instrument, the slitlamp, it is possible to tell whether a cataract will grow rapidly or change so slowly that for years there may be scarcely any perceptible advance. I would be derelict in my duty if I failed to have you understand that no form of medical treatment has ever changed the course of a senile cataract, no drug, no serum—nothing.

Glaucoma is a hardening of the eyeball. It is of such sinister force and such wide distribution that everyone should know about its manifestations. In one form there is redness of the eye, accompanied by sudden loss of sight, pain, nausea, vomiting and the symptoms of a gastro-intestinal upset. If seen early and an operation properly performed, sight is frequently recovered.

The other type is unaccompanied by redness or pain but, like a thief in the night, it steals sight by gradual encroachment on the field until only the central vision remains. It is one of the most perplexing of eye diseases and calls for the best in ophthalmoscopic diagnosis and therapeutic skill. If patients are placed under treatment before the field of vision—the ability to see about—is much reduced, glaucoma can be checked.

When a patient has transitory attacks of blurred vision, he should immediately consult an eye specialist.

High blood-pressure is an example of foreordination or predestination, for heredity plays the principal rôle in its production, onset, and course. One form is, however, preventable: that which develops in the course of pregnancy. The ophthalmologist is the one most competent to advise when the fetus should be removed, for he is able to recognize the premonitory signs of approaching disaster. High blood-pressure is often diagnosed by the ophthalmologist in his routine examination of the eyes.

If we admit that man is as old as his arteries, then heredity and his physical and mental condition determine the time when poor vision will result from circulatory disease. A particular type of arteriosclerosis involves the minute blood-vessels which supply the center of sight. Those afflicted are unable to read but they can see things about them and never go blind.

Pernicious habits produce poor sight. The nearsighted child who persists in reading in the dark corners of a room, the patient who uses alcohol or tobacco to excess, and the fair one who wishes to remove superfluous hair by drugs, are all drifting on a treacherous sea where the uncharted rocks which lead to blindness are hidden from view.

Hereditary tendencies express themselves in many ways. Some can be helped if discovered early and correctly treated; others can be retarded, but in a few nothing can be done to postpone the advancing darkness.

Poor vision may be the effect of occupation.

The retina, the seeing layer of the eye, may be separated from its base either by growth beneath it, progressive nearsightedness, or a blow on the eye. The patient becomes conscious that a portion of his field of vision is absent or that a floating cloud partially covers his sight. If the detachment is the result of a tumor, the eye must be removed. If it is the result of a stretching or a tearing of the retina, it is susceptible to treatment by the use of special electric currents.

General diseases cause poor sight. In scarlet fever the patient may have kidney complications which will cause retinal disease. In diphtheria there may be a temporary paralysis of the focusing muscle, making reading impossible; in diabetes, there may be hemorrhage, an instability of the focusing power, and a curious optic nerve affection which causes marked reduction in central vision. In tuberculosis of the bones and general body structures there may be an actual destruction of parts of the eye. Pulmonary tuberculosis, however, rarely causes a severe eye lesion. Syphilis, in both the inherited and acquired types, causes failing vision. Brain tumor is often first discovered by the eye specialist.

Prolonged close application is best performed under correct illumination. Campaigns for better lighting are most heartily endorsed, but we cannot sanction the too enthusiastic statements that such measures will eliminate either the need for spectacles or reduce the incidence of eye disease.

And, finally, to the disciples of health, the advocates of physical fitness and the guardian of both, the physician, I urge an aggressive campaign for the prevention of ocular disease by its early recognition and efficient treatment, with an urgent insistence that those who need glasses wear them to preserve their sight.

I leave a word of cheer to those with cataract, a message of hope to those with glaucoma, and an admonition of caution to those predisposed to circulatory diseases.

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Play Activities for the Visually Handicapped Child

Although the physical education program in the schools is a comparatively new contribution to the curriculum, its value to the growing child has long been recognized. While its purpose in the beginning was to provide the child with periodic exercise, the philosophy grew that a well rounded program of physical education should develop musculature, and also certain habits and attitudes not only in regard to activity but in social relationships as well. It should provide a basis or a background upon which to build a worthwhile structure of leisure time activities. We are all familiar with the joy that the orthopedically handicapped child takes in physical recreation no matter how simplified it may be. We have seen the baseball teams which consist of twenty members rather than the usual nine, some of whom can run, some of whom can bat, some of whom can catch, all co-operating in a group venture and all building toward social organization and adaptation.

The so-called normal children present very definite individual needs and capacities. There will be a range in the average physical education class from the child with poor co-ordinations, flabby musculature, apathetic attitude and who is passive in the extreme toward social activities, to the child who is well muscled, finely co-ordinated, possessor of an excellent sense of timing, a knowledge and an interest in both individual and group activities and, if anything, too aggressive in his social reactions. The physical education program can be adapted in the average school that has indoor and outdoor facilities to meet the needs of all the children in the school, whether they need vigorous, modified or restricted activity. There should be opportunity for participation in physical education instruction and in play for every child in the school. There should be corrective work for those who would profit by it and a higher type of competition for those whose physical condition warrants it. This program in the average school should be developed through a close co-operation between physical education teachers, the school physician and the nurse, for it is in this way that the people responsible for the service and supervision of the health program can exchange views and correlate their efforts. Where there are youngsters in the school who have handicaps, their program in the academic curriculum is often subject to alterations and adaptations, and the same should be true of the physical education program. It has been recognized that adaptations in academic work were not only possible, but advisable, and too often no thought was given to the need for continuing physical activity. This can be readily un-

derstood in places where the program is limited or where the instructor has not had recommendations made for a restricted or modified program.

While it is necessary in many cases, because of the greater opportunity afforded, to list partially seeing children in a special class, it is essential that these children be segregated only in that part of their program requiring close eye work. It would seem that segregation is not only justifiable, but to be highly recommended when the child may profit more through the opportunities which should be inherent in the smaller and more homogeneous group. However, in cases where the child can adapt with facility to the larger and more heterogeneous class situation, he should participate with others in social activities. This is true not only of physical education and recreation, but music and other activities as well. There are certain prerequisites to such a plan, for, if a physical education teacher is available, the needs of the child with visual handicaps should be fully explained, their capacities outlined, and cautions stated. The physician or the specialist should make the recommendation for the participation in physical education activities and he, in turn, should understand what the possibilities of such a program may be. One child may be able to take part in all phases of the physical education program, whether it be rhythms, dancing, stunts and tumbling, games or sports, while another child may be limited to those comparatively unexciting low organization activities with more or less stereotyped floor patterns and very little in the way of vigorous muscular exercise. This, of course, would depend upon the condition of the child, the prognosis of his difficulty and the recommendation of the physician in charge.

One of the first responsibilities in the education of any child who is handicapped is to assist the child in the acceptance of and the adjustment to his particular handicap. His assets must be encouraged and developed in order that his liabilities may be met without hazard. If this is done, the child will more clearly understand the extent of his handicap without developing an anxiety in regard to it. This makes for a much better program because of understanding on the part of both the teacher and the pupil.

The chief difficulty that the classroom teacher would meet in program planning for a group which would include one or more children with visual difficulties would be her lack of knowledge of activities. Her lack would be not in understanding, but in materials. Some play activities can be used for the normal and the handicapped without adaptation; some may require a recognition of the importance of such details as length of the playing area,

type of equipment used and other similar mechanical factors. There are many activities, of course, which it would be necessary to revise completely, but this, if carefully done, need not detract from the interest of any of the children for the activity. For those children who have greatly restricted vision, some dances with great freedom of movement and wide range of floor pattern might not be desirable. However, there are many of the traditional rhythmic activities with a more or less stereotyped floor pattern so that the child may have a feeling of confidence and hence a freedom of movement.

A teacher who knows and loves children will readily see the need for physical recreation. The physical education teacher must learn from the sight-saving class teacher the guideposts that are a part of the sight-saving philosophy. The classroom teacher could gain from the physical education teacher a knowledge of techniques and materials that would enable her to carry out the daily need for recreation. Not only would the teachers profit through such an association, but the child with a handicap would have open to him new activities, new interests, new fields to conquer.

RUTH ABERNATHY
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Throw Away Your Glasses*

The history of quackery constitutes one of the most curious chapters in the records of humanity. The outstanding facts appear to be that the world is never without a goodly sprinkling of clever impostors, persons who are brilliantly successful in misleading others for a pecuniary reward; and, on the other hand, that a very large percentage of the human race is at all times ready and even eager to be fooled.

It is now almost a daily occurrence for the eye physician to be asked by patients what he thinks about "eye exercises." Knowing that this expression belongs chiefly to the vocabulary of the professional quack, the oculist's reply to such inquiries is likely to be rather explosively vigorous or contemptuous, and perhaps not sufficiently explanatory. Most of us are so sure of our own ground, so intimately conscious of ocular structure and optical principle, that we hardly give sufficient consideration to the perplexity of the patient who has heard of this or that alleged wonderful cure.

How many of us have had curiosity and patience to acquire and read the arguments of the professional eye exercisers? An enterprising colleague recently handed the present writer a volume printed in England and published by an Ameri-

* An editorial, reprinted, with permission, from the *American Journal of Ophthalmology*, August, 1936.

can firm under the title *The Improvement of Sight by Natural Methods*. The author is one C. S. Price, M.B.E., who describes himself as "Late Captain Australian Army Medical Corps, Principal of the School of Eyesight Training (London), Director of the Radionic Therapy Centre (London)," and who in the subtitle claims for his book that it is "A complete treatise upon the newer methods of treating all conditions of imperfect sight by natural means, and obviating the necessity for glasses, drugs, or operations."

Price evidently wishes to be regarded as highly respectable, and he makes occasional polite bows to the regular medical profession. His book "does not purport to be a treatise upon optics, nor should it be interpreted with undue criticism of orthodox methods." It gives "the actual principles and practice of the methods of Eyesight Training applied with such outstanding success for many years by the author . . . its instruction may be followed in all cases with perfect safety. . . no book can adequately take the place of a qualified personal instructor, who alone can diagnose and synthesize for each individual case." Price acknowledges himself the not too slavish disciple of "the late revered Dr. W. H. Bates, M.D."

On what new and startling basis does the author undertake to remove optical defects? Price's presentation is singularly lacking in any revolutionary statement as to the fundamentals of ocular anatomy. In fact, he has apparently delved deeply into a number of standard textbooks on the eye, and under such headings as "Short Sight," "Long Sight and Astigmatism," and "Squint" he follows for the most part quite ordinary lines. Under "Simple Physiology of the Eye" he mentions three theories: that of Helmholtz, that of Tscherning, and that of Bates (!), "who maintains that the ciliary muscle plays little or no part in accommodation, the adjustment being brought about solely by the action of the extrinsic muscles on the whole eyeball and not on the lens specifically." But Price carefully avoids controversy on this subject.

His actual heresies include statements that the "orthodox oculist," in using lenses and optical apparatus, "endeavors to cure one kind of strain by adding another"; that glasses maintain the error which they seek to correct, and that the exercises which he advocates restore normal focus. All such statements are categorically made, without any attempt at logical proof.

What are the therapeutic measures recommended, the so-called exercises which are to do away with the need for glasses? Essentially, they resolve themselves into a great variety of maneuvers, some ludicrous but many obvious and quite lacking in mystery, to produce relaxation of the eyes.

For example, if when tired of reading you have covered your eyes

with your hands, you have (probably without knowing it) performed one of the classical "exercises" for "the improvement of sight by natural methods." This is practically what Bates and his disciples would call by the fancy title of "palming." Quite a fundamental maneuver, apparently, is the "re-establishment of normal blinking." "Flashing" is the process of regarding an object for three seconds only and then closing the eyes. "Shifting" is moving the focus from one point to another and avoiding a fixed stare. "Alternate focus" on near and distant objects is recommended, with each eye separately or both together.

"Dr. Bates," we are told, "wrote that central fixation was lost in all cases of abnormal conditions of the eyes, whether functional or organic." So you are to practice "central fixation," because "when an eye is suffering any refractive error of focus . . . the image is focused irregularly and over a larger area, with the result that many of the nerve ends of less sensitiveness, lying outside the macular area, . . . are taxed with a stimulus beyond their capacity, and the result is obviously a strain." The exercises proposed for restoring "central fixation" are quite childish and futile. One of them is to look repeatedly for a second at one of a group of large letters at its remote limit of visibility, closing the eyes in the intervals, "until you feel you can ignore the other letters." Another is to read through a circular hole in a card which is carried across the printed page. Another is "to examine the small spaces inside the letters of ordinary reading type."

"Methods of relaxation" include Bates' "palming" and "swinging." A good deal of nonsensical detail is given as to the precise technique of "palming," but practically it amounts to nothing more than resting the eyes by covering them while relaxing the mind. "Swinging" or "swaying" is little more than rhythmic turning of the body from side to side with the eyes closed.

The chapter on "Exercises in Visual Co-ordination" includes a series of tongue twisters such as our old friend, "Round the rugged rocks the ragged rascals ran." The chapter on "Visual Illusions" reproduces a series of familiar diagrams, study of which by the patient is supposed to stimulate the ability to change focus at will.

Most of the material in Price's book serves as bait, of relatively harmless appearance, for attracting the reader to the author's "clinic." But here and there he indulges in claims which go beyond the idea of throwing away your glasses, and which can only be described as criminally and inhumanly dishonest. His special methods are applied to "diseased eyes and blindness." "Swaying" exercises are used in cases of glaucoma, in which "considerable relief and improvement are possible along the lines indicated in . . . this book." In nystagmus he claims "most ex-

cellent and permanent results . . . by . . . palming, swaying," and other exercises. For amblyopia "the general principles of eyesight training advocated . . . will invariably prove completely successful even in the worst cases." ". . . practice of the principles of macular vision will, in most cases, be . . . successful in . . . reestablishing the colour sense." A special chapter is devoted to "Blind and Incurables." "Such cases as can and have actually been benefited, include . . . ophthalmia neonatorum . . . retinal detachments, as well as many post-operative cases of glaucoma, cataract and associated conditions."

After reading Price's volume, one wonders what it is all about, and the answer is that any excuse will serve to encourage omission of glasses by those who need them but are prejudiced against their use. The colleague referred to early in this editorial suggests that he who undertakes to advise in matters of health should possess three qualities: namely, natural intelligence, education and honesty. Those whom we regard as quacks may possess two of these qualities but not all three. The reader may form his own conclusions as to which of the triad of qualities is most lacking in Price's case.

The incontrovertible physical facts which utterly contradict the fantastic statements of Bates and his followers, including Price, are those of ocular structure and measurement and of physiologic optics.

A difference of one-fiftieth of an inch in length of the eyeball represents a very important difference in focus of parallel and other rays upon the retina. If, other things being equal, the eye is one-fiftieth of an inch too short, then the eye is roughly one-and-a-half diopters hyperopic or farsighted, and is subjected to the formidable amount of eyestrain that this refractive error involves. If, in relation to the refractive value of the ocular media, the eye is one-fiftieth of an inch too long, then the eye is approximately one- and -a- half diopters myopic, with a correspondingly pronounced defect of shortsightedness or myopia.

The ophthalmometric measurements of corneal astigmatism, constant from day to day and often from year to year, are irrefragable proofs that we are dealing with an organic defect of corneal curvature. The facts disclosed by the ophthalmoscope, retinoscope, and trial case may be less obvious and in part more complicated for the feeble or unwilling understandings of quacks and prejudiced patients; but they are none the less conclusive and irrefutable to the trained and intelligent mind. For people like Bates and Price to deny these facts is evidence of ignorance, obtuseness, or dishonesty, or sometimes of a combination of more than one of these mental and moral shortcomings.

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Note and Comment

National Society Notes.—Hundreds of workers in the movement to prevent blindness and conserve vision throughout the United States attended the three-day annual conference of the National Society for the Prevention of Blindness early in December, in Columbus, Ohio. The 44 speakers on the program included authorities from the professions of medicine, nursing, education, social welfare, safety engineering and related fields.

Most auspicious as an anticipatory event for the annual conference was the participation of Dr. Park Lewis, a vice president of the Society, in the nation-wide radio broadcast during the "We The People" hour on Sunday, November 29.

An enthusiastic audience attended the annual meeting of the Society, December 11, in the Russell Sage Foundation Building, at which Lena R. Waters, Director of the Department of Social Service at the Hospital of the University of Pennsylvania, was the chief speaker. Her subject was: "Social Interrelationships in Sight Conservation." Preceding Miss Waters was President William Fellowes Morgan, who reviewed the work of the year and voiced the hope of an ever-expanding program for the Society.

The Society is glad to announce that Mr. Lyman A. Bliss of New York, N. Y., and Dr. William Zentmayer, ophthalmologist of Philadelphia, Pa., have kindly accepted invitations to serve on the Board of Directors of this Society, succeeding the late John L. Wilkie and the late Dr. Thomas B. Holloway. It gives us pleasure also to announce that Dr. Mark Schoenberg has accepted the place left vacant on the Board of Editors of the SIGHT-SAVING REVIEW by the death of Dr. William H. Wilmer.

An article entitled "Lighting the Lamp of Learning," by Winifred Hathaway, associate director, will appear in a forthcoming issue of *Progressive Education*. Other articles by the staff include a series by Francia Baird Crocker, R.N., associate for nursing activities, in *Public Health Nursing* for January, February, and March, 1937, under the title, "A School Program for Eye Health." Reprints of this series, as well as of the article by Mrs. Hathaway, will be available upon request.

The development of local prevention of blindness movements has commanded the attention of Eleanor Brown Merrill, associate director. She has recently been called to Washington, D. C.; St. Louis, Mo., and Philadelphia, Pa., in connection with training of personnel for local and state programs.

In connection with various programs for integrating eye health in college training, Dr. Anette M. Phelan, staff associate in education, visited Kokomo, Ind.; Madison, Minneapolis and St. Cloud, Minn.; Columbus, Ohio, and Milwaukee, Wis.

Current Articles of Interest

The Problem of Eye Injuries, Constance G. Hartwell, M.D., and William D. Rowland, M.D., *New England Journal of Medicine,* August 13, 1936, published weekly by the Massachusetts Medical Society, Boston, Mass. The experience of the authors, given and illustrated by cases, indicates this summary and these conclusions: "When one is confronted with an eye injury, the following points should be borne in mind:

1. Immediate or early care, regardless of the extent of injury, is always advisable;
2. Careful and early surgical repair of torn lids will insure best function and fewer scars;
3. X-ray to complete a diagnosis and a giant magnet to remove deep foreign bodies are essential equipment in many cases;
4. Infection is usually apparent early and is introduced, with few exceptions, at the instant of penetrating wounds;
5. Consultation with an eye surgeon or among eye surgeons is sound practice;
6. Careful watching and efficient therapeutics are imperative if the injured eye is to be saved and sympathetic involvement of the fellow eye prevented or controlled."

The Year's Progress in Illumination, W. C. Brown, *Transactions of the Illuminating Engineering Society,* November, 1936, published monthly by the Illuminating Engineering Society, New York, N. Y. This detailed report covers the following topics: light sources; ultraviolet radiation; reflecting and transmitting materials; school lighting; office lighting; industrial lighting; store lighting; luminous buildings; exposition lighting; home lighting; farm lighting; street and highway lighting; motor vehicle lighting; railroad lighting; airplane lighting; miscellaneous new devices, controls, etc., and natural lighting.

Lighting at School and at Home, *Health Bulletin for Teachers,* Vol. VIII, No. 3, November, 1936, published by Metropolitan Life Insurance Company, School Health Bureau—Welfare Division, New York, N. Y. Principles of good lighting are discussed

and the advice given that, "to put the principles of adequate light without glare into effect requires constant adjustment to environment. The change from a sunny to a gloomy atmosphere, the position of the body and the work in relation to the light source, the light-absorbing character of the materials used, all have to be reckoned with. But if the principles of good lighting are adhered to, the normal eye will render good service without strain, and the abnormal eye may be assisted in carrying the seeing load."

A Study of the Reactions of Physically Normal, Blind, and Deaf Children to Questions in a Verbal Intelligence Test, B. F. Holland, Ph.D., *The Teachers Forum*, September, 1936, published monthly by the American Foundation for the Blind, Inc., New York, N. Y. The author's interpretation of the data obtained appeared to justify these inferences: "(a) that the similarities and differences revealed by the gross scores are not due altogether to the factor of intelligence; (b) that the chief differences between the physically normal and blind and the deaf are due to the language handicaps of the deaf; (c) that ability to react to abstract relations depends upon meaning accruing from a particular type of sensory data, though audition is the most important sensory avenue for the mastery of language; (d) that particular questions are difficult for all types of subjects when they are complicated in structure and when they contain words or ideas beyond the range of the experiences of the subjects; (e) that the blind children, especially those of the third grade, have greater capacity to attend to materials presented orally than do physically normal children; and (f) that deaf children are hampered in reacting to various situations by their unwillingness to attack problems without help."

Constitutional Considerations of Trachoma; and **The Constitutional Treatment of Trachoma,** Hans Schroeder, M.D., *The Eye, Ear, Nose and Throat Monthly*, July and September, 1936, published monthly by Professional Press, Inc., Chicago, Ill. In these two articles Dr. Schroeder discusses trachoma and its treatment in detail, and expresses the belief that "by supplying the body with the deficient substances, as mentioned in the treatment, trachoma can be controlled and eradicated—with sufficient attention to iodine and vitamin C supply to the organism."

Pupillary Variability in 108 Syphilitic Patients, Theodore M. Shapira, M.D., and F. M. Crage, M.D., *American Journal of Ophthalmology*, October, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. The following results of tabulation are given:

"In this series of 108 syphilitic patients, 32 patients had pupillary irregularity in both eyes; in 8 patients the pupils were irregular in one eye;

"Pupils were unequal in 42 patients;

"Pupils did not react to accommodation in 19 patients;

"Reaction to light was absent in 33 patients;

"Definite typical Argyll Robertson pupils were present in 17 patients;

"Five patients showed reflex pupillary rigidity;

"Considering a miotic pupil as being less than 2.5 mm., miosis was present in both eyes in 15 patients and in one eye in 16 patients."

A New Operation for Chronic Glaucoma: Restoration of Physiological Function by Opening Schlemm's Canal under Direct Magnified Vision, Otto Barkan, M.D., *American Journal of Ophthalmology*, November, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. To quote: "It is suggested that this operation, which restores the physiological function of Schlemm's canal, solves the surgical problem of most cases of chronic primary glaucoma. It is equally successful in certain cases of secondary glaucoma. The results are predictable and appear to be permanent. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber and Schlemm's canal are under full view and magnified during the operation. The operation is without danger when the proper technique is used and has proved completely successful in the writer's hands when certain preoperative indications (binocular biomicroscopic diagnosis) have been fulfilled."

Visual Tasks in Sight-Saving Classes, Matthew Luckiesh, Ph.D., and Frank K. Moss, Ph.D., *American Journal of Ophthalmology*, November, 1936, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. This article is based upon an investiga-

tion of "72 pupils in the seventh, eighth, and ninth grades of sight-saving classes located in four different schools. Ten adult subjects possessing normal or near-normal vision were also used in order to permit the appraisal of the results obtained upon an absolute basis as well as upon a relative one. Type size, as a factor in seeing, was appraised by visibility measurements made with the Luckiesh-Moss Ophthalmic Sensitometer."

The Relationship of Eye Defects to School Failures, George L. King, Jr., M.D., and Dorothea Keplinger, M.A., *The Ohio State Medical Journal,* April, 1936, published monthly by the Ohio State Medical Association, Columbus, Ohio.

The authors state that this study has led to the following convictions: "Every failing child should have a complete physical examination including refraction under cycloplegic before being returned to the educational system," and "A proper approach to the failure problem can be achieved only by close co-operation between physicians and educators. By this cooperation only can the appalling record of failures be improved upon to the benefit of the child and of society in general."

The Diagnosis and Treatment of the Ocular Complications of Syphilis, Wm. M. James, M.D., *The Journal of the Missouri State Medical Association,* June, 1936, published monthly by the Missouri State Medical Association, St. Louis, Mo. Four conclusions are reached in this paper, as follows: "(1) Blindness due to syphilis can be eradicated by the early recognition and adequate treatment of syphilis; (2) Treatment of the infiltrative localized eye lesion is very successful; (3) The treatment of optic nerve atrophy is often delayed so long that useful vision has been lost before therapy has been instituted; (4) In about 50 per cent of the cases of optic nerve atrophy, seen early and carefully treated, good vision can be maintained indefinitely."

Book Reviews

THE AMBLYOPIA READER: A SYSTEM OF EYESIGHT DEVELOPMENT. Foreword and notes by Margaret Dobson, M.D., London: Theodore Hamblin Ltd., 1935, 94 p. ill. (New York: American Optical Co.)

The Dobson *Amblyopia Reader* is an excellent, rather de luxe sample of material badly needed in the treatment of squint amblyopia. The chief deterrent to the publication of much more similar material is its cost, and since this must be kept low because of the great amount required in any individual case, there will always be a limited supply of well presented books.

The book consists of 93 pages printed in two colors—red and black—with a preface outlining the theory and practice of the treatment. Essentially a red filter is used before the sound eye, which makes it impossible for this eye to distinguish the characters or lines printed in red and hence forces the amblyopic eye into this task. The idea is a good one and fits in with standardized practice in treating functional amblyopia. The chief drawback to the book is the choice of material. Eighty of the 93 pages consist of nursery rhymes familiar to many children and therefore susceptible to recitation rather than reading. It would be preferable to have unfamiliar, even incoherent material utilized for this work because: (1) It would be more difficult to memorize and so the value of the book in any individual case would be prolonged; and (2) It would reduce the possibilities of guessing what the next word will be.

Dr. Dobson has made a valuable contribution to amblyopia therapy. It is to be hoped that a greater abundance of such material can be made available at a not prohibitive cost.

LEGRAND H. HARDY, M.D.

TURNING NIGHT INTO DAY, THE STORY OF LIGHTING. M. Ilin, Philadelphia: J. B. Lippincott Co., 1936, 120 p. ill.

This book gives a picture of early and later methods (Russian) of lighting the home. One of the interesting points brought out

in this study of lighting is that although certain discoveries and inventions are attributed to definite persons, often people in many countries were working along similar lines and, in several instances, contributed something to the final discovery or product.

The illustrations are indicative of Russian life, but, with a few exceptions, they are not sufficiently clear to give much help in interpreting the various phases in the development of illumination.

The book has an excellent summary.

WINIFRED HATHAWAY

Briefer Comment

THE CANADIAN NATIONAL INSTITUTE FOR THE BLIND ANNUAL REPORT, Year Ending March 31, 1936. Toronto, Ontario. 88 p. ill.

This report is inspiring in its presentation of the wide scope of activities of the Canadian National Institute for the Blind. Of special interest to those concerned with saving sight are the report of the registration of the blind of Canada and review of each case; the description of the work being carried on against trachoma among the Indians; and the chairmen's reports of the various divisions of the Institute on the prevention of blindness activities, which include examination and treatment, provision of glasses, distribution of pamphlets and posters, and lectures.

SPEAKING FOR SAFETY. Chicago: National Safety Council, 1936, 74 p.

In this pamphlet the National Safety Council has issued "a handbook for the safety speaker," which contains "facts and figures, suggestions and a wealth of information of practical use in preparing the address." Accident prevention agencies are listed, as well as literature, posters, and film and other services available from the Council. In addition, a bibliography is given of selected references on general accident prevention and on public speaking. The pamphlet does indeed contain a "wealth of information" and should prove of value not only to the speaker on safety but to anyone interested in preventing accidents in industry, on the streets, at school and in the home.

EXOPHTHALMIC GOITER AND ITS MEDICAL TREATMENT. Israel Bram, M.D. St. Louis: The C. V. Mosby Company, 1936. 456 p. ill.

Of interest to oculists especially is the chapter on "Eye Symptoms in Exophthalmic Goiter," covering a section of 26 pages.

Books Received

HAYNES, WILLIAMS: *Men, Money and Molecules.* 216 p. ill. Doubleday, Doran & Company, Inc.

PEEK, GEORGE N., WITH SAMUEL CROWTHER: *Why Quit Our Own.* 356 p. D. Van Nostrand Company, Inc.

POUND, ARTHUR: *Industrial America: Its Way of Work and Thought.* 236 p. ill. Little, Brown and Company.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from THE SIGHT-SAVING REVIEW. New publications will be announced quarterly.

217. Choral Speaking—An Aid in the Sight-Saving Class, Helen A. Anthony. 12 p. 10 cts. Reprinted from the *Sight-Saving Class Exchange*, Number 58, November, 1936.

218. Guarding the Sight of School Children, Edward Jackson, M.D. 12 p. 10 cts. For the majority of people in this and other civilized countries, the activities of the years of school life constitute the greatest stress and danger to sight they ever encounter.

219. The Management of Industrial Eye Injuries in their Relation to the Workmen's Compensation Laws, Elbert S. Sherman, M.D. 12 p. 10 cts. The compensation laws have been largely responsible for the creation of the new medical specialty: industrial or traumatic surgery, in which ophthalmology plays an important part.

220. Variations in Visual Acuity Among College Students, Ruth E. Boynton, M.D. 12 p. 10 cts. The author presents results of an analysis of the visual acuity among a thousand college students—comparing their visual acuity at enrollment with the visual acuity at graduation.

221. Congenital and Hereditary Diseases of the Eye, E. Clifford Place, M.D. 12 p. 10 cts. Congenital and hereditary diseases account for about one half of all blindness: many of these diseases could be reduced through intelligent medical and public co-operation.

222. Conservation of Vision—Infant and Preschool Age, Albert Frost, M.D. 12 p. 10 cts. The author emphasizes the need of thorough medical eye care in children before they reach school age, especially in such cases as cross-eyes and congenital cataracts.

223. Progress in the Use and Application of Photo-Electric Cell Control, Aksel J. C. Knudstrup. 4 p. 5 cts. The use of the photo-electric cell in controlling lighting in schoolrooms is an innovation which promises much practical application.

224. What the Community Should Know About Failing Vision, Arthur J. Bedell, M.D. 8 p. 5 cts. The author urges an aggressive campaign for the prevention of ocular disease by its early recognition and efficient treatment, with an urgent insistence that those who need glasses wear them to preserve their sight.

225. Play Activities for the Visually Handicapped Child, Ruth Abernathy. 8 p. 5 cts. A pro-

gram is outlined for the physical education teacher who must learn from the sight-saving class teacher the guideposts that are a part of the sight-saving philosophy.

226. Throw Away Your Glasses, W. H. Crisp, M.D. 12 p. 5 cts. Editorial reprinted from *American Journal of Ophthalmology*, pointing out the misunderstandings of quacks and prejudiced patients; exposes the fallacies of the "Bates' Method."

D93. Lighting the Lamp of Learning, Winifred Hathaway. Reprinted from *Progressive Education*, January, 1937. 6 p. ill. 5 cts. The author gives specifications for adequate light in the classroom under all conditions, necessary to protect the sight which is the real lamp of learning.

D94. Surrounding Eyes with Safety, J. W. Beall. Reprinted from *Safety Engineering*, December, 1936. 2 p. ill. 5 cts. Quoting from tables of statistics showing the history of eye accidents in Ohio industries over a period of ten years, the author explains why safety is better than compensation.

D95. Food in Relation to the Eyes, Park Lewis, M.D. Reprinted from *American Journal of Nursing*, January, 1937. 8 p. 5 cts. Discussion of diet in relation to the eyes, with special reference to vitamin deficiencies.

Contributors to This Issue

Interested in many different phases of sight conservation, **Dr. Edward Jackson** is active both as Chairman of the American Committee on Optics and Visual Physiology and as a Consulting Editor of the *Amerian Journal of Ophthalmology.*

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The Director of the Students' Health Service of the University of Minnesota, **Dr. Ruth E. Boynton,** is also Secretary-Treasurer of the American Student Health Association.

Dr. E. Clifford Place is a member of the Brooklyn Ophthalmology Society and an active ophthalmologist in Brooklyn, N. Y.

A professor at Ohio State University, **Dr. Albert Frost** is Chairman of the Department of Ophthalmology there.

Aksel J. C. Knudstrup is an illuminating engineer with the Governmental Service Bureau at the Potomac Electric Power Company in Washington, D. C.

Book reviewers: **Dr. LeGrand H. Hardy** is in charge of the eye service at the Fifth Avenue Hospital in New York City, and **Winifred Hathaway** is an associate director of the National Society for the Prevention of Blindness.

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Let There Be Sight!

THE National Society for the Prevention of Blindness is an incorporated lay organization engaged in a program of eliminating preventable loss of sight. It carries on the following services:

1. Preventing eye infections of newborn babies.
2. Preventing infant blindness or other eye tragedies from syphilis by recommending a blood test and the necessary prenatal treatment, where indicated, for every expectant mother.
3. Demonstrating methods of vision testing of preschool children.
4. Co-operating with educational authorities in establishing sight-saving classes, and training teachers for this special work.
5. Promoting the training and placement of medical social workers in eye hospitals and clinics.
6. Co-operating with industry to reduce eye injuries.
7. Promoting research into causes of blindness and impaired vision.
8. Helping to eradicate preventable eye diseases.

Publications, exhibits, films, lantern slides, lectures, charts and assistance in sight-saving projects are available on request.

PERIODICALS: *Sight-Saving Review*, $2 a year; *Sight-Saving Class Exchange*, for teachers and supervisors of sight-saving classes; and an annual report.

Associate Membership, $50–$100	Subscribing Membership, $5
Sustaining Membership, $10–$50	Contributing Membership, $2

The Society is supported entirely by contributions, membership dues, legacies and bequests.

Donations in any amount are needed and will be gratefully received.

NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS, INC.

50 West 50th Street, New York, N. Y.

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PREVENTION OF BLINDNESS